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# Agriculture

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# *Agriculture*

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*Cover photograph:* Not mine! *Photo: John L. Jones*

# Lessons from the 1960 Haymaking Studies

CLAUDE CULPIN, O.B.E., M.A.
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Mr. Culpin follows his article "Quick Haymaking" in our April issue by reporting some of the results of N.A.A.S. investigations into haymaking methods during the 1960 season.

1960 proved to be a very good season from the viewpoint of assessing the value of new haymaking methods. Up till the end of June, the weather of spring and early summer was as fine as could be desired, whereas later in the year haymaking became steadily more difficult. Preliminary trials at three of the Ministry's Experimental Husbandry Farms in 1959 had shown that when a hay crop was cut by flail forage harvester, the time taken to dry it was substantially reduced, but yield from the forage harvester-cut plots was appreciably less than that from similar areas treated by the normal 'quick haymaking' mower/tedder routine. It was therefore decided not only to intensify the work at the Experimental Husbandry Farms, but also to conduct an investigation on several commercial farms where the farmer intended to try using his forage harvester in the hay crop.

## *Aim of the investigation*

It was decided to ask the farmers to choose a uniform field, and to set out, side by side in the field, three plots on which the following treatments would be carried out.

1. Cut by mower. Ted early and follow up with the normal 'quick haymaking' technique.
2. Cut by forage harvester. Follow up with normal hay equipment.
3. Cut by mower. Ted early by forage harvester, and follow up with normal hay equipment.

Twenty-one farmers took part in the investigation, though not all of them were able to carry out all of the three treatments. A Lancashire farmer did more, adding plots in which use of a roller crusher was also studied. Records were kept of all the operations carried out on the crop, and when it was

baled the bales produced were counted, a fair proportion (on some farms, all) were weighed, and samples were taken for dry matter analysis. Thus, knowing the plot areas, it was possible to determine the yields of dry matter produced by the various treatments. In a trial of this kind, experience shows that it is inadvisable to rely too much on the results obtained on any one farm, but important general trends can be detected, provided that the job is studied on several farms in different crops and conditions.

## *Results from commercial farms: drying rates*

In the fine or fair weather that prevailed during the trial on most farms, cutting by forage harvester greatly reduced the drying time, and tedding by forage harvester produced an intermediate effect. In fine weather, several crops treated by forage harvester were quite fit to bale in 30 hours, and produced some excellent hay. The average number of operations carried out, and the average time that elapsed between cutting and baling, were:

| | No. of operations (incl. cutting, excl. baling) | Time (hr) between cutting and baling |
|---|---|---|
| Mower/tedder | 6·0 | 89 |
| Cut forage harvester | 4·5 | 53 |
| Cut mower/tedded forage harvester | 4·8 | 73 |

The average times were appreciably increased by two farms that ran into lengthy wet spells. On several farms, owing mainly to the absence of a good tedder, the control treatment left something to be desired, and this resulted in a longer drying time for the control method than was really necessary. On the other hand, the forage harvester plots were on average considerably drier at baling than the control, so the relative figures given may be considered to provide a reasonably fair comparison.

## *Effect of treatment on yield*

Treatment by forage harvester produced, on average, an appreciable loss of yield, but the results were very variable. The following figures show the average effects produced by all three treatments. The figures in brackets indicate the number of farms included in the average.

| | Average dry matter | Average bale weight | Average dry matter yield per acre |
|---|---|---|---|
| | *per cent* | *lb* | *cwt* |
| Mower/tedder | 73·6 (19) | 52 (20) | 38·9 (19) |
| Cut forage harvester | 80·6 (19) | 42 (20) | 33·6 (19) |
| Cut mower/tedded forage harvester | 78·0 (10) | 46 (11) | 33·8 (10) |

Direct comparison could be made between the mower/tedder method and cutting by forage harvester on 19 farms, and the average difference in yield was 5·3 cwt dry matter per acre less on the forage harvester-cut plots. Similarly, a direct comparison with tedding by forage harvester was possible on 10 farms, and here the average reduction in yield caused by using the forage harvester was 2·6 cwt dry matter per acre. On 6 farms the loss from cutting by forage harvester was quite serious, the difference in yield between this treatment and the control being over 10 cwt of dry matter per acre. On

3 farms, on the other hand, the forage harvester treatment produced more dry matter than the control plot by a margin of 5 cwt or more per acre. Thus, significant loss of yield by using the forage harvester is not inevitable, but is quite likely to occur when machines such as were in general use in 1960 are employed.

The main cause of loss of yield is undoubtedly chaffing of the crop, and the chief cause of this is a high rotor speed. Work at the Experimental Husbandry Farms and by the N.I.A.E. shows that some of the machine factors involved in avoidance of chaffing are: special pulleys to provide a low rotor speed at full engine power; a machine with flails in good condition and a general design that provides freedom from blocking at low rotor speeds; a powerful tractor that can work at a high forward speed, even in a heavy crop; and a delivery that puts the crop gently back on to the ground in a neat yet fluffy swath.

The forage harvester is seen to advantage when it is used for cutting a laid crop. It can pick up herbage that an ordinary mower fails to cut, and in such circumstances can produce a higher yield of hay than a mower. On rough land, on the other hand, where the flails have to be set high, this can cause a low yield due to leaving a long stubble.

Crops which do not appear to be at all suitable for cutting by forage harvester are very young ones—for example clover that is not yet in flower—and also very stemmy ones, which are easily broken into short pieces in the machine.

## *Forage harvesters used as tedders*

Use of the forage harvester as a tedder showed considerable promise on several farms. There was usually a marked bruising effect, but much less tendency to chaffing than where the machine was used for direct cutting. Unfortunately, not all machines could be used without serious trouble from blocking, but such troubles can probably be eliminated fairly easily. It seems best to work the swath in the opposite direction to that taken by the mower. Work at Drayton and Bridget's Experimental Husbandry Farms, and also at the N.I.A.E., supports the view that in standing crops, cutting by mower and using the forage harvester as a tedder may prove to be a technique that deserves wide adoption. It would not be very difficult to improve the design of some machines to meet such a need.

## *Use of roller crushers and crimpers*

Three of the Experimental Husbandry Farms (Bridget's, Drayton and Great House) included modern American roller crushers or crimpers, or both, in their haymaking experiments. As on the Lancashire commercial farm included in the investigation, the results were encouraging. Heavy treatment with the roller crusher or crimper produced an increased drying rate, comparable with that produced by the flail forage harvester, without producing any serious chaffing. The advantage of the roller crusher or crimper over the forage harvester used as a tedder was that it could work faster and needed less power to operate. Different makes of crimper and roller crusher differ in design, and as a result of one season's work it is not possible to say that a crimper is better than a roller crusher or vice versa.

The disadvantage of either is that it is a specialized machine, with no other obvious uses. However, there is no reason why such machines should not have a long life, and with models which can be used at the same time as the mower, crushing the swath out on the previous round, the cost of this operation can be small.

## *Wet weather effects*

Long-continued rain was encountered on only one or two of the commercial farms, but work on two of the Experimental Husbandry Farms (Bridget's and Drayton) and by the N.I.A.E. continued well into the wet weather. In general it was found that, as with early tedding, swaths that were drying more rapidly before rain absorbed moisture easily, but were still ahead a few hours after drying conditions returned. However, though benefits of drastic swath treatment in showery weather are not completely lost, they are much smaller. Figures from the work at Drayton show the order of the effect. Typical results were:

| | Mower/tedder | Flail |
|---|---|---|
| Good conditions. No rain. | | |
| Moisture content after 29 hours (per cent) | 42 | 34 |
| Bad conditions. 1·4 in. rain. | | |
| Moisture content after 122 hours (per cent) | 38 | 34 |

Thus it must not be expected that in a normal haymaking season either forage harvesters or machines such as roller crushers and crimpers will always produce as good results as they did in the spring of 1960. A full experimental programme in a more normal season is needed before it will be possible to decide whether the use of forage harvesters, roller crushers or crimpers is preferable, or indeed whether a good modern tedder is the best solution.

## *Great scope for early tedding*

Though the 1960 investigations tended to confirm the value of drastic swath treatment, they also showed again how few farmers are equipped with a suitable machine or have any real desire to practise early tedding. A modern single-row p.t.o.-driven tedder is not an expensive machine, and it can work very fast. For every farmer who could with advantage start practising really drastic swath treatment, there are at least ten whose first step should be to advance to a quick haymaking technique based on a tedder.

# The Problem of the Disposal of Cereal Straw

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On a mixed farm, straw is best turned into dung. Where no livestock are kept, arable farmers should plough their straw in; but if this delays ploughing or hinders autumn cultivations, they should bale as much as possible for sale, and burn the rest.

THE disposal of cereal straw first became a problem in this country when the combine harvester appeared on British farms immediately before the last war. This coincided with a time when beef prices were low and feeding bullocks in yards was more than ever the surest way of losing money. In the old style of farming, cereal grain provided a cash return and the straw, when trodden into dung, was the principal means of keeping the land in good heart. Economically this system was sound only when prices for corn and beef could carry the high proportion of land devoted to growing stockfeed. If these conditions were satisfied there was no problem of straw disposal. Straw was a valuable commodity, both as litter for stock and because the ability of the straw to soak up animal faeces and urine resulted in a manure which could readily be forked and loaded by hand for transport to the fields. Cereals were harvested by binder, and so the straw had to be brought either to a central stackyard or to some roadside headland ready for carting to the yards. Selling straw off the farm was regarded as the first step on the road to ruin, and burning straw was a farming crime.

However, reluctant though many farmers were to abandon traditional principles, the pressure of economic events and the coming of the combine that harvested cereals without clearing the straw from the land underlined the need for investigating other ways of utilizing straw. Could fertility be maintained more economically than by carting the straw off the land back to yards and back again as dung? What was the effect of ploughing-in straw, and did it make a contribution to soil fertility comparable with that of a dressing of dung? Was profitable crop production dependent on the return of straw to the land in some form?

## *Twenty-five years of experiment*

To answer these and other related questions, rotation experiments were started at Rothamsted in 1934 and at the Norfolk Agricultural Station two years later. The results of the Rothamsted experiments, which were reviewed in the Rothamsted Annual Reports, particularly those of 1951 and 1958, showed that the chief effects of ploughing-in straw for barley, sugar beet and potatoes on a heavy loam were to supply potash and render the nitrogen reserves in the soil unavailable to the plant. Analyses at Rothamsted indicated that 30 cwt of straw contained the equivalent of 0·6 cwt muriate of potash, and the benefit of the extra potash from direct applications of straw was most marked for potatoes. Barley and sugar beet are less responsive to potash than potatoes on the Rothamsted farm and, for these crops, direct applications of straw slightly reduced yields owing to the temporary locking up of available nitrogen in the soil. The residues from straw ploughed in for the preceding crop had little effect on either barley or root crop yields.

At the Norfolk Agricultural Station, straw was ploughed in every other year for wheat or sugar beet in a four course rotation of wheat—sugar beet—barley—hay, and this treatment was compared with ploughing-in dung or carting the straw off the land. The ratio of straw to dung was fixed at 1 to 4 by weight; 55 cwt of straw or 11 tons of dung were applied during the rotation to the appropriate plots, and for every ton of straw ploughed in, $\frac{3}{4}$ cwt sulphate of ammonia was given as a seedbed dressing to the following crop. Apart from this supplementary nitrogen and the straw or dung ploughed in, the only fertilizer used was a complete basal dressing for the sugar beet equivalent to about 7 cwt of a 10 : 8 : 5 compound.

After twenty years the effects of the experimental treatments were briefly as follows. Dung increased the yield of beet and cereals by about 30 per cent, and this was particularly noteworthy in the case of beet because this crop, unlike the cereals, did receive some inorganic fertilizer, though only a moderate dressing by today's standards. Direct application of straw had no value for beet, but the effect of the straw residues for the following barley crop was around two-thirds that of the dung residues: the same relation also obtained for the yields of wheat after direct applications of straw and dung when the chaffed straw was spread on the seeds ley in the earlier part of the year. In general, crop responses either to straw or dung did not appear to improve the longer the trials continued, and this lack of evidence for any cumulative build-up of fertility in the soil was borne out by the results of soil analyses. Although there was some increase in phosphate and potash status on the dunged plots, ploughing-in straw failed to bring about any change in analysis except that in one experiment there was a slight improvement (0·1 per cent) in organic carbon content during the twenty-year period, a change comparable with that reported by Rothamsted.

## *Straw and inorganic fertilizers*

In these experiments, therefore, the outstanding value of dung was demonstrated and ploughing-in straw, although less effective than dung, nevertheless produced a considerable improvement in crop yield. The whole experiment, however, was carried out at a much lower level of fertilizer use than is now accepted as good farming practice. The knowledge that the return of straw can enhance yields on potash-deficient land does not justify us in concluding that an organic manure, whether dung or straw, has some special value, for example, in improving soil texture, over and above the plant nutrients which it supplies and which can be equally well provided from a bag. To answer this question we must test the effect of the organic manure under conditions where optimal amounts of plant nutrients are available to the crop. This has been the aim of the more recent experiments both at the Norfolk Agricultural Station and at several of the Ministry's Experimental Husbandry Farms. These trials have been in progress for about eight years, and although the responses to dung or straw dressings in combination with commonly applied rates of fertilizer have been variable, there has so far been very little to show for ploughing-in straw that could not be explained as a side effect of the extra nitrogen which is always given when straw is ploughed in, to compensate for the losses in available soil nitrogen sustained in the process of rotting down.

This is not to say that the return of organic residues to the soil is of no importance in the maintenance of fertility. Organic matter is present in all soils, and a certain minimum appears to be necessary for healthy plant growth. With many soils the proportion of organic matter can fall surprisingly low before crops begin to suffer but, with certain classes of soil, problems of structure and aeration are likely to develop if the reserves are seriously depleted.

On these 'problem' soils, which in general are those with a high proportion of silt or fine sand, the need to conserve humus calls for the maximum return of organic residues as well as keeping to a sound cropping rotation. Where these soils are farmed without livestock it is worth while to return straw to the land, although ploughing it in directly presents some practical difficulties.

## *Problems of ploughing-in*

The chief problem is to maintain a good standard of ploughing when a heavy bulk of straw has to be turned in. This is more serious on clay land, where ploughing more deeply may hold up the autumn programme of work and increase the risk of late ploughing, with all the subsquent troubles that this brings. The task of burying the straw below the furrow slice is made easier if the swath behind the combine can be broken up and spread evenly over the ground. A straw spreader on the combine is the cheapest way of doing this and, since the straw of modern cereal varieties is typically short and brittle, is quite effective, although less so in a high wind. The forage harvester is probably the ideal tool for the purpose, though obviously not justified for this job alone: the alternative of a straw chopper for the combine is an expensive accessory except for large acreages.

Unless the straw can be broken up and spread, there is a need to anchor the swath to the ground, or blockages will occur during ploughing. Undersowing the corn crop with grass or clover produces a stubble growth which helps to bind the straw: for a limited acreage, particularly where sheep are kept, the practice provides useful autumn grazing, and the straw is trodden into the ground and can be turned in more readily. Irrespective of whether the straw has been cleared or not, many growers on light land regard the undersowing of corn for stubble grazing and subsequent ploughing in as an excellent preparation for potatoes. It is interesting to note that, in experiments, treading in straw by sheep folded on beet tops or a one-year ley had only ten per cent less effect on crop yields than where a dung dressing was given but the beet tops and hay were removed.

Another difficulty of ploughing-in straw is that straw lying on the land after harvest hinders thorough stubble cleaning. Opinions differ on the real merits of stubble cleaning, and perhaps in the future chemical weed control will make it possible to dispense with the traditional cultivations. But at present the cost is too high, except for emergency measures, and although no critical work has been done on the effect of stubble cultivations on annual weed population, it is commonly believed that straw on the land tends to increase weediness. Any serious infestation with couch would be difficult to tackle by cultivations if there was any quantity of straw on the surface. Rotary cultivation of stubbles has been advocated as a method of controlling couch, and it would at the same time churn the straw into the soil, but it is a slow operation especially if the ground is hard and scarcely a feasible one on large acreages. Moreover, rotary cultivation is rarely a satisfactory

preparation for ploughing on clay soils, which are the ones where ploughing-in straw is the most difficult to accomplish effectively.

### *Selling or burning straw*

From the foregoing discussion it is clear that except on farms without livestock, where it is advisable to return all organic residues, there is everything to be said for clearing the straw from the land and either using it to litter and feed livestock or selling it to someone else who wants to do the same. Most farms now have a pick-up baler or can hire one, and provided the straw can be baled dry there is usually some opportunity during harvest when the bales are fit to cart at any rate for home consumption, although weathered straw has little value off the farm. The costs of baling and carting straw are quoted by the Farm Economics Branch of the Cambridge School of Agriculture at about £2 per acre, which leaves a reasonable margin based on the current ex farm price. But undoubtedly the best demand is for wire tied bales threshed from a drum.

If, however, the acreage of cereals is too large for all the straw to be dealt with as the harvest proceeds, it is surely better to burn off the excess straw at the outset rather than be left with quantities of weathered straw which, although not worth gathering, must somehow be cleared from the land at considerable expense. Burning straw is hardly yet respectable, but now that we have a better understanding of how to use artificial fertilizers and also know how little crop yield is apparently affected by ploughing-in straw, the practice seems less immoral than in the palmy days of the four course rotation. Perhaps its reputation has suffered from association with 'prairie' farming and continuous cereal growing. But although it cannot be denied that burning straw is inherently wasteful, any excess of unsaleable straw is better burnt than gathered into a rotting pile which gradually assumes the likeness but not the value of a muck heap.

Experimental evidence so far on burning straw shows neither any increase nor reduction in yield as compared with removing it. A special case for burning stubbles and straw is when the cereal crop is badly infested with wild oats. Although many of the seeds will survive the burning, numbers are damaged sufficiently for their dormancy to be broken: these seeds germinate and can be destroyed by cultivation. Hence, although a single burning cannot achieve any spectacular eradication, the incidence of wild oats in the next crop is reduced, and in conjunction with other measures such as cultivating where possible rather than ploughing, burning helps to bring about a gradual reduction of the infestation.

Straw utilization can be summed up briefly thus. A system of farming that combines intensive arable cropping with a livestock enterprise is one where there is the least waste of crop residues and by-products. In such a system straw is made into dung, and this is the best way to use it: if yarded cattle are not kept, the next best way is for stock to tread it into the ground as they graze the stubbles. On farms without livestock, where the soil structure is apt to deteriorate under intensive cultivation, taking the necessary trouble to plough in straw effectively is justified. Otherwise it is best to plan for baling as much straw as possible in good condition for sale, and set a match to the remainder. The important point is that unless straw can be cleared from the land profitably its potential value is so small that gain can turn to loss if its conservation entails less good cultivations.

# Chemical Control of Water Weeds

R. J. CHANCELLOR, M.A.

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**The A.R.C. Weed Research Organization has been investigating the advantages and complications attendant on the chemical control of water weeds. Mr. Chancellor discusses some aspects of the problem.**

THE last few years have seen an increasing interest in the use of chemicals for controlling water plants. Inquiries that have been received emphasize the shortage and high cost of labour, and the need for a cheaper and quicker method of control than clearing by hand or machine. Some inquirers have already turned to herbicides; others view the use of chemical methods with suspicion. All need to control the growth of aquatic vegetation, but the precise nature of the problem and the methods of control that are acceptable vary from one situation to another.

About one-tenth of British plants live in or very close to water. They are a most interesting group that includes not only some rare plants, but also some which by their prolific and persistent growth can cause considerable nuisance; for example the reed (*Phragmites communis*) and the branched bur-reed (*Sparganium ramosum*). For convenience, water plants are often divided up into groups based upon their degree of adaptation to water and called emergent, floating or submerged plants.

## *Nuisances caused by water weeds*

The topography and nature of land utilization in the United Kingdom make it essential to keep our watercourses clear if we are to prevent the flooding of large stretches of our countryside. The two most critical times for flooding are from January to March and midsummer. In winter, when water levels are highest, even minor obstructions can cause trouble, while in summer rank growth of weeds can quickly block watercourses and a heavy storm may cause much damage, especially to standing crops along the banks. Flooding can be especially costly in flat lands where drainage is naturally slow and arable crops are of particular value. River Boards and Internal Drainage Authorities are chiefly responsible for keeping the growth of vegetation in important watercourses to a minimum, and other organizations and farmers too are sometimes responsible for maintaining drainage ditches on their land.

Another occasional annoyance to farmers caused by water weeds is the hindrance to watering cattle. Cattle can be denied access to water by a dense fringe of reeds, bulrushes and other emergent water plants, but more often the trouble lies in a floating plant completely covering the surface of the water. Duckweeds (*Lemna* spp.) are a frequent nuisance in this respect, and so is *Azolla filiculoides*, a floating fern, although the latter much less frequently in this country than in Australia, where not only does it hinder stock drinking, but is said also to taint water.[1] Both duckweeds and *Azolla* can cover static or slow-moving water completely.

In addition to the practical necessities of maintaining water levels and

ensuring good land drainage, certain recreational and sporting activities can be affected by excessive growth of water plants. Of these, fishing is the most important: one-third of recent inquiries about controlling water plants came from fishermen. Although their requirements vary according to the locality, they consist generally of a limited amount of submerged weed for fish cover and a thin fringe of reeds along the bank. Pleasure boating can be hindered, or even completely prevented, by the presence of submerged weeds, and recent inquirers have complained of milfoils (*Myriophyllum*) and horned pondweed (*Zannichellia palustris*) in fresh water and various sea weeds in salt water. Bathing is popular in this country in suitable weather and, although water weeds rarely cause serious harm to swimmers, they are often a nuisance and may limit the use of otherwise suitable bathing places.

Mechanical clearing of water plants is generally carried out by the River and Internal Drainage Boards, but much of the mechanical equipment available is necessarily limited in its usefulness and many operations are best performed manually. Manual labour is becoming increasingly hard to obtain, particularly because of the dirty and strenuous nature of the work and the necessarily short working season, and if this state of affairs continues to get worse, a suitable alternative will ultimately have to be found. Apart from those officially responsible for maintaining watercourses, many individuals or small concerns also wish to control water plants in a very limited area. They generally have few resources and require a cheap yet adequate method of control or eradication. From these come the bulk of inquiries concerning the use of herbicides.

## *Chemical treatment of emergent weeds*

Because of the growing interest in chemical control of water plants the Agricultural Research Council's Weed Research Organization at Oxford has carried out some experiments[2] to assess the usefulness of herbicides for this purpose. Emergent water weeds are less of a problem than submerged ones, because the vegetation can be treated directly and contamination of the water is reduced. Two main factors have to be considered when choosing a herbicide for treating emergent plants. Foremost is the question of toxicity, not only to man and his animals, but also to fish and the organisms that form their food. Secondly there is the solubility of the chemical in water. Formulations based on oil, and applied usually as oil emulsions, are liable to contaminate water. Dalapon, which will kill grasses and a few monocotyledonous plants that are closely related to them, has so far proved to be the most satisfactory chemical available. Most emergent water plants of large size are grasses or are closely akin to them, so that they fall neatly within the range of species controlled by dalapon. The only common large emergent plants that are dicotyledons and resistant to dalapon are purple loosestrife (*Lythrum salicaria*) and the great water dock (*Rumex hydrolapathum*). This selectivity of dalapon may also favour the preservation or even the increase of certain rare and interesting plants.

## *What plants will take over cleared water?*

There is, however, one danger connected with this limited specificity of dalapon, and that is the change in the composition of the vegetation following

the treatment. If an area containing mixed resistant and susceptible plants is sprayed, it is reasonable to suppose that the resulting vegetation will be mainly composed of the resistant species, which is satisfactory if they are small. But if the vegetation is of susceptible plants alone, then it may not be apparent at the time what the subsequent flora will be, and it may be no improvement on the original. One such unfortunate result was obtained in 1960. A pure stand of reed-grass (*Glyceria maxima*) growing out of flowing water was eradicated by spraying with dalapon in 1959, but in the following year starwort (*Callitriche*), which is mainly submerged in habit and at present untreatable, had taken over the area. A careful inspection of areas to be treated is essential, therefore, if a change of one problem for another, which might be harder to solve, is to be avoided. The situation is possibly easier where there is no surface water, as in ditches that dry out in summer, but even here there is the possibility of undesirable weeds such as stinging nettles becoming established. The spread of small plants that are resistant to dalapon need not be detrimental because they do no harm, and by colonizing the soil on bare areas of the banks hold it together against erosion.

Dalapon, when applied to rhizomatous plants, and most emergent plants are rhizomatous, rarely gives complete kill even of susceptible species. An 80 per cent reduction of aerial shoots is a normal and useful result that could help in maintaining watercourses, while for the fisherman it should be ideal. Another chemical which has been tested and might be used with dalapon is amino triazole. It has given similar results to dalapon in preliminary experiments,[2] but it is less selective and probably would also kill many of the small plants that prevent erosion of the banks.

## *Danger of pollution in control of submerged weeds*

The control of submerged weeds is much more difficult. For many years the standard chemical treatment was sodium arsenite, which although harmless to fish when used at the correct concentrations was not without other dangers. It was never widely used[3, 4, 5] and is now no longer recommended. Therefore the announcement[6] from North America of a new technique for controlling submerged weeds without contaminating the water was received with great interest in this country. In essence the procedure was to broadcast into the water pellets containing such herbicides as 2,4-D, in a relatively insoluble form so that the chemical would never reach appreciable concentrations in the water as a whole. By this method the treatment is localized, and the chemical is assumed to act through the roots in close contact with the pellets. The prevention of appreciable contamination is most important because the water may later come in contact with sensitive crop plants. Tests with pelleted herbicides carried out during the last two years have been rather disappointing,[7] except in ditches where water movement has been prevented by means of dams.[8]

Some unpelleted herbicides such as acrolein, copper sulphate, monuron and simazine have limited uses, particularly in static water, but there is at present no safe chemical for the control of submerged weeds in general.

There are some who believe that no chemicals of any kind should be used to control water weeds, because freshwater communities form some of the last remaining relatively undisturbed nature reserves in the country.

This, then, is the present position with regard to problems connected with

the control of water weeds. The general picture doubtless changes slowly over the years; some factors contribute to the increase of water plants, such as the reduction of commercial traffic on inland waterways, the great increase in the use of artificial fertilizers that must drain into most areas of fresh water, and the discontinuance of the use of reeds for thatching and other purposes. On the other hand, new drainage schemes or the improvement of existing ones will tend to decrease them. Whatever the general situation, it seems likely that chemicals will play a definite part, but that we should proceed slowly and with great care.

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# Fifth British Weed Control Conference

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The 1960 Weed Control Conference was held at Brighton on 8th-10th November. Some exciting developments were discussed, including two chemicals which may satisfactorily control wild oats in wheat and barley.

WE have had some twenty years in which the all-important aim has been maximum production at any reasonable cost, and now we are finding it difficult to put low-cost production first; nevertheless, in the future, chemical weed-killers will be judged more and more by their cost in relation to the job they do, said Dr. H. G. Sanders in the opening paper of the Conference. Dr. K. P. Buckholtz, President of the Weed Society of America, pointed out in the following paper that in the United States there had been a three- to five-fold increase in crop production per man-hour in the past twenty years, and that the greatest increase of efficiency was in those crops where the use of chemical weed-killers had been greatest. Thus was the scene set for a conference in which were discussed aspects of education and advice on the use of chemical weed-killers, technical matters such as specific crop or weed problems for which weed-killers offer some solution, problems of formulation and application of weed-killers to increase their reliability, the influence of weed-killer on normal husbandry practices, and so on.

## *Wild oats*

One session which aroused much interest was on the chemical control of wild oats. It seems that at last we are in sight of a reliable control of wild oats in wheat and barley. Two chemicals were discussed, one of which acts through the soil, killing wild oats as they emerge, and the second of which acts through the leaves, and is effective on wild oat seedlings. The soil-acting chemical is 2, 3-dichloroallyl diisopropylthiolcarbamate, which, for want of a coined common name, was called simply Chemical X at the Conference; the leaf-acting wild oat killer is barban.

Chemical X is applied to the soil at a dose in the region of 1½ lb per acre during the preparation of the seedbed for a crop of spring wheat or barley. It must be mixed into the soil immediately on application, as it is volatile and would otherwise be dissipated. Adequate incorporation of the chemical was stressed, and it appears that the crop should not be sown for at least a few days afterwards. Although barley tends to be more resistant than wheat, the dose required to control the wild oats may slightly reduce the density of either crop. This may be overcome after further study of the time interval between spraying and sowing, incorporation techniques and depth of drilling. Higher seed rates would also overcome it, but the yields of experimentally treated crops of barley suggest that the reduced density of the crop is really of little importance.

Barban has to be applied to wild oats at about the time when they have two

fully expanded leaves, and this means that there may be only ten days or a fortnight during which spraying can successfully be carried out. When the wild oats have three or more fully expanded leaves a good control cannot be expected. Barban is a very active herbicide, and a dose in the region of 4 or 6 oz per acre is proving effective. However, it seems that to ensure a good control at this dose the crop has to be vigorous and competitive to prevent recovery of the wild oats. Competition is relatively unimportant for adequate control with Chemical X. Certain barley varieties, notably Proctor, are not sufficiently resistant to barban to permit its use, and winter wheat passes through a rather susceptible stage in early spring. Barban has an advantage over Chemical X in that one can better judge the need for its use, as spraying is not carried out until the wild oats can be seen. Neither weed-killer is foolproof, and both are subject to a number of factors which can influence their effectiveness; nevertheless we have two essentially complementary weed-killers which bring high hopes of solving the wild oat problem.

## *Perennial problems*

Another weed which came under the heavy artillery of the research workers was bracken. Dr. Elsie Conway pointed out that the fronds of bracken are temporary organs of a massive underground stem which should be the main target of attack, and that the number of expanded fronds gives no adequate picture of the usually large reserve of buds below ground which are capable of producing further fronds. Any successful chemical, therefore, has to enter the frond and move freely within the plant so that a toxic concentration may reach all parts of the large underground system. Two herbicides which hold some promise of controlling bracken are 4-CPA and amino triazole, but further research is required before either can be considered reliable. One factor which appears of particular importance is the time of spraying. Bracken sprayed experimentally at intervals through the season by Mr. D. S. C. Erskine showed increasing susceptibility to 4-CPA up to about the time when the frond was fully expanded, after which the bracken increased in resistance again. The optimum time of spraying with amino triazole, however, does not seem to be necessarily the same as for 4-CPA.

Perennial weeds, with their underground reserves, present an especially difficult problem to research workers, and a further perennial weed which also defies a universally good control by chemicals is couch or twitch. It is interesting to note how in the sessions on both bracken and couch some aspect of the growth of these weeds, their morphology, physiology and so on were first discussed. Empirical methods have not revealed wholly satisfactory means of chemically controlling many perennial weeds and the problem is being attacked on a more fundamental botanical and physiological level. Considering the biological factors which may affect the efficiency of herbicide treatments on couch (*Agropyron repens*), Dr. G. Sagar pointed out that control methods which depend upon the use of chemicals rely for their success on many factors, both environmental and innate. Reporting on trials with amino triazole, Dr. K. Holly showed that the chemical has a very considerable potential for the control of *Agropyron repens*, but that the conditions enabling it to produce its maximum effect, and the reason for variable results obtained, must be elucidated if it is to be reliable in the field. Much the same point was also made about dalapon by the author.

A machine designed to improve the reliability of soil-acting weed-killers was described by Mr. J. D. Fryer. The efficiency of a weed-killer applied before sowing or before emergence is greatly influenced by the manner in which it is incorporated in the soil, and by all the environmental and soil factors that can affect its distribution and stability in the soil. These and other factors interact, and jointly determine the results obtained in the field. Some method must be found of controlling as many of these factors as possible if the reliability of pre-sowing and pre-emergence treatments with soil-acting weed-killers is to be improved. With this object in view a machine has been developed named the spray incorporating drill. It is designed to apply the weed-killer and incorporate it by means of rotary cultivation in bands nine inches wide, to consolidate the loose soil after incorporation, and finally to sow the crops by means of a precision-seeder unit. Preliminary tests have shown the machine to be potentially useful with some weed-killers, and a programme of extensive tests is now being planned.

Another recent development, the use of granular formulations, is also designed to increase the reliability of weed-killers. Professor G. F. Warren of Purdue University, U.S.A., described how these have been developed to broaden the selectivity of the herbicide on established or transplanted crops and to obtain better penetration through the foliage to the soil. Although there are still problems and limitations in their use, they are rapidly gaining popularity in America. This popularity is due especially to convenience.

The theme of the opening papers at the conference—the impact of chemical weed-killers on crop husbandry—was illustrated in several papers. Weed-killers and a band sprayer designed to apply them to sugar beet, swedes and kale are being developed, to permit full advantage to be taken of modern mechanized methods of cultivation. Potatoes, on which the use of weed-killer has almost been tantamount to an admission of bad husbandry, were also the subject of papers. Tractor wheels during inter-row cultivations can induce the formation of clods difficult to separate from potatoes by mechanical harvesters, and Mr. H. J. West described trials where, with the aid of weed-killers, no cultivations were carried out after planting. Yields, incidentally, were as good as from normally cultivated potatoes. The use of chemicals in improving pastures and hill grazings was the subject of a complete session.

## *Two new chemicals*

Some new chemicals were described. Mr. R. S. L. Jeater, of Jealott's Hill Research Station, described a dipyridyl weed-killer, related to diquat—the new potato haulm killer—with interesting properties, particularly on grasses. Mr. G. Barnsley of Shell Research Limited described the properties of 2,3, 6-DBN, which may find use in the selective control of perennial weeds in woody species, or as a total weed-killer. It was suggested that it may be used as a "chemical winter-fallow", cleaning land of both annual and perennial weeds before cropping in the spring.

Many other reports were presented by research workers, or "weedniks" as Mr. M. N. Gladstone, Chairman of the British Weed Control Council, jokingly called them at the Conference Banquet. It is obviously impossible here to do more than touch upon some of the more interesting points. Anyone who desires to know more will be able to buy the Proceedings when they are published.

# Elms on the Farm

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**Future supplies of field elm must come from the farmer. Its excellent wood is in increasing demand, and the bogy of elm disease has been laid.**

BROADLY speaking there are two sorts of elm in Britain. One of these, the wych elm, is also called the Scots elm, though it is equally common in the north of England and in Wales. This is a woodland tree with a spreading crown, which grows only from seed, and never from suckers or root shoots. Its botanical name is *Ulmus glabra* Huds., and it yields a supple timber valued for furniture-making, boat-building, and the framing of carts and vans.

The other group, which is our main concern here, comprises the field elms, which are far commoner along the hedgerows than in the woods. These elms vary so much that botanists find it hard to define separate species, and research is still going on to ascertain which races yield the best timber. Popular names like 'Dutch elm', 'Lock elm', and 'Huntingdon elm' cannot mean a great deal until we know how to define them, though it is true that elms of a definite character, which may form a distinct species, grow over certain districts, such as Huntingdonshire and the Welsh Borders. One of the finest races is that often called the true English elm, *Ulmus procera* Salisbury, which is seen at its best in Hertfordshire, Essex, and Suffolk. It forms a magnificent tree up to 140 feet tall and 25 feet in girth, with a grand towering crown of foliage, and it features in many of the landscapes of Constable, who loved to paint its soaring masses of green rising above the quiet meadows of his Suffolk rivers.

## *Several native English strains*

Early writers maintained that all elms were introduced trees. That is certainly untrue of the wych elm, which boasts an ancient Welsh name, *llwyfanen*; while recent studies of the field elms suggest that several English strains have no Continental counterparts, and have therefore developed, over a long period of time, on this side of the Channel. The main reason why the strains remain fairly distinct is that field elms seldom reproduce by seed. The roots of any large field elm give rise to upright shoots called suckers, and after a big old tree is felled this sucker growth is exceptionally vigorous. There are always plenty of young shoots to replace the fallen parent, and of course each is exactly like it in its botanical characters.

Those suckers that spring up in the fields have a pretty short life. They are either ripped up by the plough, or browsed down by livestock. Elm foliage is very palatable to sheep and cattle, and goat keepers often gather it as fodder for their stock; horses will even gnaw elm bark. But suckers that arise in the shelter of a hedge have a fair chance of survival. Indeed, they merit protection as a source of future timber and income to the farm. In some districts there have always been elms along the hedgerows—survivors no

doubt of those ancient forests on fertile soils that were cleared to give productive arable land. In other districts the landowners deliberately planted elms as an investment, especially during the period of active enclosures around the year 1800; old records of estates and forest tree nurseries show that there was an active trade in elms for hedgerow planting, and this may often explain why all the elms of one particular parish show the same characteristics—all came from one nursery, and possibly from one parent tree.

There are three reasons why the preservation, and possibly the fresh planting, of elms on English farms is becoming a live topic today. First, it has become clear that our supplies of field elm timber are never likely to be drawn from our forests. This tree demands really good soil and favourable surroundings if it is to grow rapidly to a desirable size. It wants lots of moisture at its roots, and ample room to expand its crown. Those kinds of land that can be spared to the forester are never likely to grow worthwhile field elm, so we must look to the farmer for future supplies of this wood. Second, the demand for elm timber has increased, and shows every sign of continuing at a high level. Elm was always wanted in the country joiner's workshop because, unlike other timbers, it will not split when things are driven into it. He used it for chair seats—to hold the legs, especially in the famous Windsor chair; and also for the hubs of cart wheels, to hold the spokes. Because it was available in broad planks, he used it for coffins, rustic furniture, and waney-edged weather boarding. Other remarkable traditional uses were as water-pipes, the working parts of water pumps, and the keels of wooden warships whenever oak of sufficient size could not be found.

Coffins, of course, are still in steady demand! But the bulk of the new call for elm comes from the furniture industry. Though difficult to work with hand tools, elm is excellent material for the modern furniture factory, with its powerful machinery and methods of mass production. It is strong, tough, attractive to look at, available in large sizes of log and in ample quantities. Therefore it holds its own in competition with imported hardwoods from all over the world.

The third reason is that the shadow of the dreaded elm disease, which once appeared to threaten the very existence of our elms, has at last been lifted. The publication in September this year of the Forestry Commission's Bulletin No. 33* revealed the whole story. The author of this bulletin, Mr. T. R. Peace, who is now the Commission's Chief Research Officer, has had the remarkable experience of surveying the subject for thirty-three years, ever since the disease first appeared at Totteridge in Hertfordshire in 1927, and his conclusions are decidedly hopeful.

## *Elm disease no longer feared*

Elm disease was first observed in France in 1918. It caused severe havoc in Holland a few years later, probably because nearly all the elms there were of a particular variety, *Ulmus hollandica* var. *belgica*, which is particularly susceptible. At first its cause puzzled the experts, but eventually it was proved to be due to a minute fungus, *Ceratostomella ulmi*, which develops within the actual wood and stops the flow of sap. This fungus produces spores below the bark of infected trees, and these spores are carried from one tree

**The Status and Development of Elm Disease in Britain.* Forestry Commission Bulletin No. 33. H.M.S.O. 10*s.* (by post 10*s.* 6*d.*)

to another by the little elm bark beetle, *Scolytus scolytus*. This beetle is a very effective agent of spread, because although it *breeds* mainly in sickly elms, excavating galleries below the bark, it *feeds* on the twigs of healthy elms, which thus become infected with the disease. The beetle has been known for a long time, but knowledge that it carries this disease is a recent development.

The main outward symptom of attack is the sudden wilting and withering of all the leaves on one branch of an elm tree, at the height of summer. The next year more branches suffer, and in a serious case the whole tree dies within a year or so. It is then attacked by hordes of beetles, and its bark becomes riddled with the tiny 'shot-holes' that mark their points of entry and exit.

In most countries where elm disease has been recognized, the authorities have insisted on affected trees being destroyed. Such measures were not thought practicable in Britain, and although owners have been advised to get rid of badly infested trees, they have not been compelled to do so. This policy made it possible for Peace to carry out long-term studies of affected groups of elms, which he visited and photographed every year or two. Many of these photographs are reproduced in his bulletin, and they make a fascinating study. They show conclusively that, although some of our elms succumb, others recover in quite a remarkable way. It is wrong to assume that every tree stricken with the disease must inevitably die; a high proportion will pull round and resume normal growth.

What has saved our elms is, in all probability, that very diversity of strain or species, which puzzles the botanist. Unlike the elms of Holland, they are not all of one highly susceptible variety or clone. During the early years of its attacks, in the 1930s, the disease appeared to make alarming progress, possibly because it was picking out susceptible individuals as easy victims. But once those had gone, and only the relatively resistant trees remained, its status gradually declined to that of a minor nuisance, of little economic significance.

Elm disease, it must be remembered, has had a remarkably good 'press'. It has done a lot of damage on the Continent, and also in the United States of America, and as many of the trees affected had been planted for shade and scenic effect in prominent places, the disease received a lot of attention. In England, the fellings of the Great Walk elms in Windsor Great Park, and of many grand old trees in Kensington Gardens, were made the more urgent by the incidence of disease, though both groups of trees were already well past their prime. It is important to realize that, despite all the publicity that has been given to these notable outbreaks, the disease is no longer a serious menace. The elm, in fact, is no more subject to disease than many another common forest tree.

## *Planting and regeneration*

Farmers in 'elm country' may therefore give thought once more to renewing their stocks of this old-established and profitable timber tree. The districts where field elms thrive are already well marked by ample great trees; generally speaking they are lowlands and fertile river valleys, often with a clay soil. Field elms do not flourish on uplands, nor on poor soils of

any kind, and it is not worth while to try to grow them there. They have, however, an amazing tolerance of salt winds from off the sea, and thrive in exposed peninsulas like Thanet, the Isle of Sheppey and around Selsey Bill.

Regeneration of the elm crop is best achieved by selecting good straight sucker shoots springing directly up from the ground, and then seeing that they are not damaged when the hedge is cut and laid. They should be spaced not less than twenty feet apart, for each needs ample room. Where there are gaps to fill, sturdy transplants should be obtained from the nurseryman. They must be pit-planted, staked to support them until established, and protected against cattle and rabbits by a sleeve of wire netting. It is obviously cheaper to make use of natural suckers, which need no such care.

Anyone with mature elm trees on his property should survey them from time to time to see whether they are ripe for felling. Elm becomes marketable when it has a girth of four feet or so, measured at breast height, but its value per unit of timber volume increases markedly with size, and trees over eight feet in girth are worth twice as much, per hoppus foot, as the smaller ones. If your elms are thriving, it is as well to let them grow on into the valuable upper size classes, provided they remain sound and free from decay. The price per hoppus foot runs from 2*s.* for the smaller trees to 5*s.* for the larger ones, and 7*s.* 6*d.* for selected prime butts, the amount in each case referring to the standing tree as sold to the merchant. The value of a single tree may range, according to total size, size class, and quality, from as little as £1 to as much as £100.

Altogether, elm timber is a very valuable by-product from farm hedgerows, and will amply repay the small attention that is needed to secure the renewal of young stems.

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**Certified Strawberry Plants in England and Wales**

The annual register of growers of certified stocks of strawberry plants inspected and certified in respect of health and purity by the Ministry of Agriculture in 1960 is now available.

Copies may be obtained free from the Ministry's Plant Health Branch, Whitehall, Place, London S.W.1.

# Modern Milking

DORIS L. COURT, N.D.D.

*National Agricultural Advisory Service, South Eastern Region*

You may have modern milking machinery, but are you making the best of it? A surprisingly large number of farmers are falling short in one or other of the ways which Miss Court describes.

THE biggest change in milking over the last twenty-five years has been from hand milking to the use of the machine. But there seems to have been little real planning of an installation in the average herd; it was usual to start off with two units, and these were often increased to three if milking seemed to take longer than it should. Sometimes the extra unit showed some improvement—sometimes not. There seemed to be a feeling, however, that a cowman who handled three units was a more capable milker than one handling two; but we know now that the number of units a man handles is only an indication of his skill if they are handled effectively. The results of research combined with work study data have given us standards for comparison.

Because of this work, notably that carried out at the National Institute for Research in Dairying, every milk producer can choose the particular installation that is best suited for his herd. The main factors which will decide the number of units each man can handle effectively are the average yield of the herd and the work routine (the sequence of routine jobs that has to be carried out for every cow, such as udder washing, taking off foremilk, stripping, etc.) that the producer expects the milker to carry out on every cow. Having settled this, he can then choose the best layout to suit his needs, or check the working efficiency of his existing installation.

During the winter of 1959-60 the milk advisory staff of N.A.A.S., in conjunction with the N.I.R.D., gave a number of lectures on this subject. Any producer who wished could have the milking performance (number of cows milked per man-hour) on his farm analysed, and was given with his results the possible performance which could be achieved with his installation. It appeared that considerably better use could be made of existing equipments and this was confirmed by an analysis of the performances obtained. Over 800 analyses were made; 50 per cent had the right combination of men and units, but only half of these were using them in such a way as to achieve a good performance and efficient milking. This meant that there was scope for improvement on about 75 per cent of the farms. Many were using too many units, with the result that machines were being left on the cows too long and there was considerable overmilking. In others the number of units was correct, but the work routine was taking so long that the machines could not be used to best advantage. In others the work was poorly divided between the men, resulting in high labour costs and inefficient use of labour.

## *Three main faults*

A number of farmers asked for help with their problems, and the following

are examples of the three main faults in organization and the way in which they were put right.

EXAMPLE 1: TOO MANY UNITS. Thirty-two cows being milked by one man in a 4 stall/4 unit abreast parlour; 55 gallons of milk produced at the morning milking.

Although the analysis showed that the throughput of cows was quite good at 24 per man-hour, it was not at all satisfactory for the four units being handled. As all concentrates were fed in the parlour, it was suggested that feeding time could be a limiting factor, and the farmer was recommended to reduce the number of units. He stopped using two of them, which gave him a basic 2 stall per unit plant, and the subsequent analysis showed a good performance of 26 cows per man-hour. Overmilking had been eliminated.

EXAMPLE 2: WORK TIME TOO LONG. Sixty-one cows being milked by two men in cowsheds using 6 machine units; 127 gallons produced at morning milking. The first analysis showed a performance of 15 cows per man-hour, with possible overmilking in the region of 5½ minutes a cow. After a study of the work routine, suggestions were made for improving the method of udder washing and taking off foremilk, for eliminating the use of back-cords and weights, and for better milk handling. A second analysis showed that possible overmilking was less, and the throughput of cows had improved to 20 per man-hour.

EXAMPLE 3: POOR ORGANIZATION OF LABOUR. Thirty-six cows milked by 2 men in a 4 stall/2 unit abreast parlour; 60 gallons of milk produced at morning milking. This analysis showed a throughput of 6 cows per man-hour, with considerable overmilking. The main fault was the circulation of cows through the parlour, most of them having to be fetched in and then driven out of it back to the fields or yard. This was immediately reorganized so that circulation was automatic and one man only was required in the parlour. A second analysis has not yet been done as there were many other details that required attention, but concentration on this one very obvious point meant that straight away one man could deal with the cows on his own.

There were some farms, of course, where the layout of the buildings made it difficult for improvements in performance to be obtained. There were others where the farmer wished the men to do ancillary jobs during milking, such as attending to cream separating and feeding calves. The more work the milker is given to do, the fewer machine units can he handle properly. Ancillary jobs which fluctuate make work organization difficult, and the advantages to be gained by doing them at milking time must be set against the disadvantages of not being able to organize the routine properly.

I must emphasize that the most important effect of better organization is not merely the saving of time, but the better milking of the cows by eliminating overmilking, that is to say the time the machine units are left on after milking has actually finished. There is evidence that fast milking is good for cows and yields, and from the worker's point of view 1½-2 hours spent on milking is quite long enough.

The speed of extracting milk from the teat may be increased by using a higher level of vacuum, widening the pulsation ratio and increasing the pulsation rate. The usual recommendation is a vacuum level of 15 inches of mercury, a pulsation ratio of 3 : 1 and a pulsation rate of 60 per minute. But if the rate of extraction is increased, the work routine must allow the man to

get back to the cow quickly enough to take advantage of it, otherwise the only effect of the improvement is to increase overmilking. This has been the reason for some disappointing results.

## *Is your equipment working properly?*

There are other factors affecting milking on which more information is needed, and the first and most important is the efficiency of the machine itself. Of all machines on the farm the milking machine often receives least maintenance.

In 1952, farm dairy instructors in New Zealand carried out a check of milking machines in use on farms, and found that only 20·6 per cent were working efficiently. The most common faults were lack of sufficient reserve air due to air leaks, faulty control valves, poor seating of releaser flaps, and vacuum pumps which were either too small or inefficient.

A further check was carried out in 1958, when 41·2 per cent of the machines in use were found to be satisfactory. This can be accounted for by the fact that many milking machines are now checked every winter, or every other winter. Farmers who availed themselves of the service clearly considered it well worth while.

During the last twelve months a similar survey has been carried out by members of the milk advisory staff in the East Midlands. The results are due to be published shortly, but briefly they show similar faults on the machines in use in this country, by far the commonest being faulty vacuum control valves. These seemed to be the most neglected part of the machine; in fact many had not been touched for years. Rather surprisingly, new plants have not been free from defects, which stresses the need for really well trained fitters.

## *Pipe-line milking*

Many of the new plants going in are for pipe-line milking, which means easier planning of two-level working conditions. This is a big factor in reducing fatigue and will assume even greater importance in the future.

The design of the plant could have some effect on performance, particularly on the time the unit is idle. The time taken to empty recorder jars, the speed of getting milk along the pipe-line, the speed of getting it away from the milk pump or releaser, are all factors which assume greater significance with the tendency towards larger herd units, particularly of high yielding cows. More work still needs to be done on this.

On the other hand, milk meters used in conjunction with vacuum bulk tanks may solve some of the problems, but they will be the complete answer? There is much to be said for the recorder jar, as it combines weighing with a good milk flow indicator, and can be used as a separate receptacle from which milk can be drawn off. The selection of cows coming into a parlour always seems to be a laborious and upsetting job, and where one man only does the milking he should be able to milk them as they come. Jars will still be required for milk from freshly calved cows, and will give better control over any infected milk that has to be kept out of the bulk supply. Now that circulation cleaning methods are being improved, such jars do not have to be dismantled weekly for cleaning. This considerably reduces the work involved and the expensive breakages which used to occur.

In parlour milking, another time-consuming factor is opening and shutting doors and gates for individual cows. Because of this there is a tendency to think in terms of batch milking in a chute or herring-bone parlour. It will be argued that this means lack of individual attention to cows in the parlour, but is not this overrated, and is the parlour the place for attending to cows anyway? Now that individual feeding can be carried out in the herring-bone parlour the development of this batch milking method will increase, one of its great attractions being the reduced working area.

The feeding of concentrates in the parlour is generally accepted as being the cheapest and easiest method at present. Individual feeding elsewhere means some form of yoking, which is expensive, and some labour-saving method of feeding would need to be devised, but the idea is attractive and may develop further. Yoked feeding could lead to reduced feeding costs by making it possible to include cheaper bulky concentrates in the ration, which is not always easy to arrange in present systems.

## *Price of cleanliness*

Probably the least attractive part of milking during the winter, particularly in a wet season when kale is being strip grazed, is the cleaning of the cows; in a parlour particularly this can affect milking performance quite considerably. Shortage of straw can make matters worse, and in the south west of the country, where this is a particular problem, the use of slatted floors is being developed as an alternative. In a recent N.A.A.S. survey on straw usage in yards, it was found that just over half a ton was required per cow in semi-covered yards where food and water were outside, but over a ton per cow was required in completely covered yards—although this could be reduced if the feeding area was not littered. The price of straw can be heavy, and in some yard-and-parlour installations the saving in labour has been offset by the cost of the extra straw required.

Another aspect considered in a further survey was the cost of cleaning equipment. Admittedly this is only a very small part of the total cost of milk production, but the range of costs, even with well recognized and carefully planned methods, was quite surprising and could well bear further investigation on some farms.

The work involved in cleaning outside concrete is another item that gets too little attention at the planning stage. There have been instances in the change-over from cowshed to yard-and-parlour systems where the time taken up with cleaning has actually increased. Apart from this, most men would rather clean out a cowshed than brush great areas of concrete outside, so it is important to keep these to a minimum and make sure they are a suitable shape for mechanical cleaning. Here again further information is required on the best methods of mechanical cleaning and disposal of the slurry.

Is there still a place for cowshed milking? Most certainly, where there is a good double range shed, where the work is well organized and the size of the herd fits the shed. In terms of man-minutes per cow per week there may be little to choose between a really good cowshed system and a badly arranged yard and parlour. But it would be difficult to justify putting up a new cowshed, except for herds of up to 20 cows, as a properly organized yard-and-parlour system will save labour and has the great advantages of flexibility and

adaptability. With technical knowledge increasing so rapidly it is vital to have a system that lends itself to change.

What is the future of milking? The trend is for more cows to be milked by one man, which inevitably leads to greater streamlining of the work involved and more mechanical handling. This implies a high degree of organization, intelligent labour and very careful planning of layout. Perhaps one needs to be a minor prophet, too, to envisage the future profitability of milk, but whatever happens there will always be a place and a living for the man who can produce it cheaply.

# Colorado Beetle in 1960

H. W. JANSON

*Ministry of Agriculture Plant Pathology Laboratory, Harpenden*

Colorado beetle continues to be found on imported vegetables, and in 1960 arrived in Britain from two new sources, the Balearic Islands and the southern tip of Italy.

IN 1959 only 22 beetles were found on imported produce, and there was little news of particular interest to record. It was the second successive year to yield few beetles, but in the first ten months of 1960, 46 beetles were discovered. This is about as many as in 1956 and 1957, but the totals for these years included a number of cases in which several beetles were found simultaneously; for example, in 1957 nine beetles were found in one cargo of Spanish onions. In 1960 no large aggregation of beetles was found: there were 38 independent discoveries, which is a relatively high number. In 1959 and 1960, one and two Colorado beetle grubs respectively were found on potatoes, and it is interesting that these were the first grubs ever to be found on imported produce in this country.

Whenever a Colorado beetle is found and reported by a member of the public or by an officer of the Ministry, every effort is made to discover not only its country of origin, but also the part of the country from which it has come. This has given valuable evidence of the spread of the beetle in Europe, and often it is the first clue we have to its existence in a new place. On two occasions in 1960 we have had evidence of spread. In the first case, infested potatoes were traced to Majorca, thus providing the first indication that Colorado beetle had spread to the Balearic Islands. Subsequently we learnt that outbreaks had occurred in a limited area of Majorca and that every effort is being made to stamp them out. In the second case, a single beetle was found in a consignment of celery from Taranto, an area of Italy far south of any place where Colorado beetle had previously been reported. Infested produce came mainly from Spain, Belgium, France, Italy and Holland, about a third of the total in each year being from Spain.

The produce on which beetles were found was mainly that which experience has shown us to be dangerous; namely, leafy vegetables such as lettuce,

potatoes and onions. It is difficult to say why onions should be infested, but a possible explanation is that they are shipped at a time when Colorado beetles may be flying about in the packing or port areas.

In 1960 a new danger became evident. A number of consignments of Italian celery were imported in refrigerated trucks by a food processing factory. Five beetles were found in four separate consignments and, after the first discovery, all consignments were closely scrutinized by Ministry and factory officials, to whom we are grateful for help and co-operation. The beetles appeared not to have suffered from exposure to low temperatures in the refrigerated trucks, nor did they suffer from storage at a constant temperature of 32°F in the factory.

## *Quick spread eastwards*

For the past decade most of our knowledge of the spread of Colorado beetle in Europe has been obtained from the reporting service of the European and Mediterranean Plant Protection Organization (EPPO), but until recently information about the situation in eastern European countries has been scanty. Recently, EPPO has been able to bring the overall position up to date, and at a Plant Protection Conference in Bucharest in September 1960 it was possible to learn a little more about the course of the spread.

There seem to have been two main lines of spread eastwards, roughly along the Danube basin and, further north, through Poland. The first outbreaks in Czechoslovakia were found in 1945, a year earlier than they were reported in Yugoslavia, and by now Czechoslovakia and Hungary are wholly infested; so is a considerable part of Rumania, and in the last two years the beetle seems to have become established in Bulgaria. Colorado beetle seems first to have been found in Russia in 1949, but not to have established itself until about 1957, when 30 infestations were found; by 1960 over 7,400 had been recorded. The first invasion of Russia appears to have been from the direction of Czechoslovakia and Hungary, but later spread has probably also been from Poland and the Baltic states. It is clear that the last fifteen years have seen a very rapid eastwards spread of Colorado beetle into countries where its presence is likely to be more dangerous than in northern countries, and where it is being tackled with considerable vigour. Research into control measures is very active, and plant quarantine measures designed to limit spread are being strictly enforced.

The Ministry once again wishes to thank all those members of the public who have helped its work by reporting and sending us the Colorado beetles they have found.

# Design for Amenity and Function in Farm Buildings

J. NOEL WHITE
*Council of Industrial Design*

**Mr. White believes that in time there will be a radical reassessment of the design of farm buildings, but that present designs leave much to be desired. Where is improvement to begin?**

I THINK it is true to say that, the world over, where there is a rural economy, there you will find a sense of fitness as well as purpose.

In the twentieth century mechanization has changed the face of our countryside, particularly the downlands and the hedgerows. The change has improved productivity and to my mind the environment, perhaps because rural prosperity appeals to my eye. With this on the credit side, it is natural that those who care for, and as taxpayers subsidize agricultural building in, our rural areas should express their anxiety concerning the great expansion of such building which is rightly being promoted by the Ministry of Agriculture. Where standards exist, it is even more important to maintain them. I am therefore critical of farm buildings not because they are the worst, but because they matter more, because they are of increasing importance to the prosperity of agriculture, and the rate of building, which is developing very rapidly, can be a threat to the landscape unless the buildings are well designed. The Ministry has set aside £50 million over the next decade or so to meet one-third of the cost of such capital development.

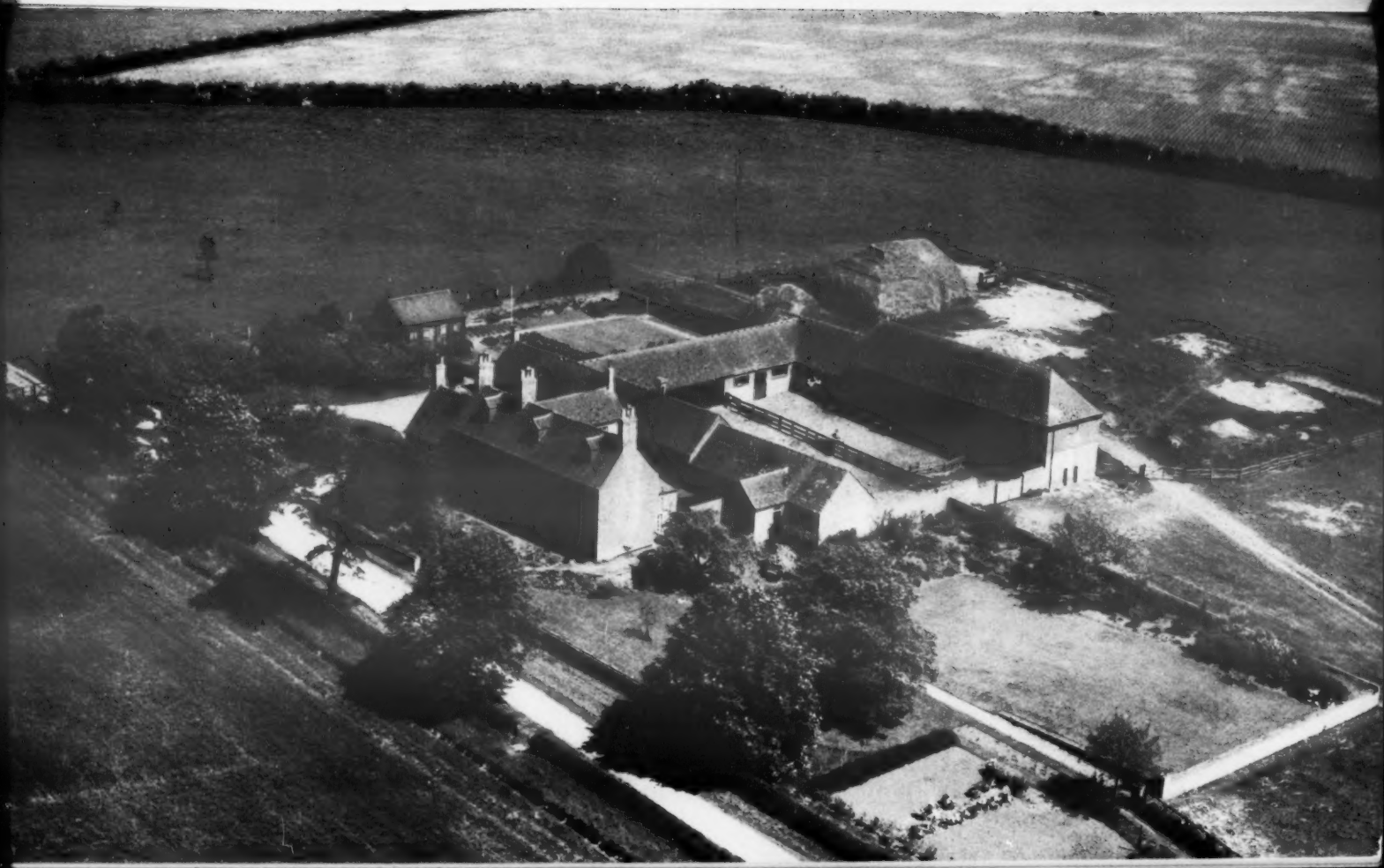
In the long run I believe that there will be some radical re-thinking of the design of farm buildings, which will bring them more into line with the latest results of method study of farming operations. By skilful application of this knowledge and inspired design, the components will become more versatile, structurally stronger and better architecturally. Meanwhile it is important to improve the design of the standard product so that better protection is given to fragile materials, the detailing of existing components achieves some architectural form, and the total effect is less strident in the landscape.

## *Enlightened use of modern materials*

The materials, concrete, steel, timber, asbestos, used in these buildings are not disreputable. Designed well, they can produce buildings of great distinction, as has been done elsewhere in Europe. Each material has its own properties, which can be exploited in a modern way for a modern function—no one but an eccentric millionaire would want to build fourteenth-century tithe barns in the twentieth century. But these materials must be handled with great skill because they are machine made and mass produced, and they must fit into a mechanized agriculture. In the old days, local materials and farm planning based on manhandling produced a compact group which harmonized with the landscape. They were easily tailored to particular circumstances and it was much harder to make a 'botch'. In the new situation I suggest that the designers of prefabricated buildings should pay more attention to pitch in relation to the general proportion of the building, and to modern requirements for ventilation and insulation. The fitting and joining of the component parts, particularly at gable-ends and



*Opposite:* A traditional layout, based on manhandling, using easily tailored local materials which harmonize with the landscape. Photo: *Aerofilms Ltd.*

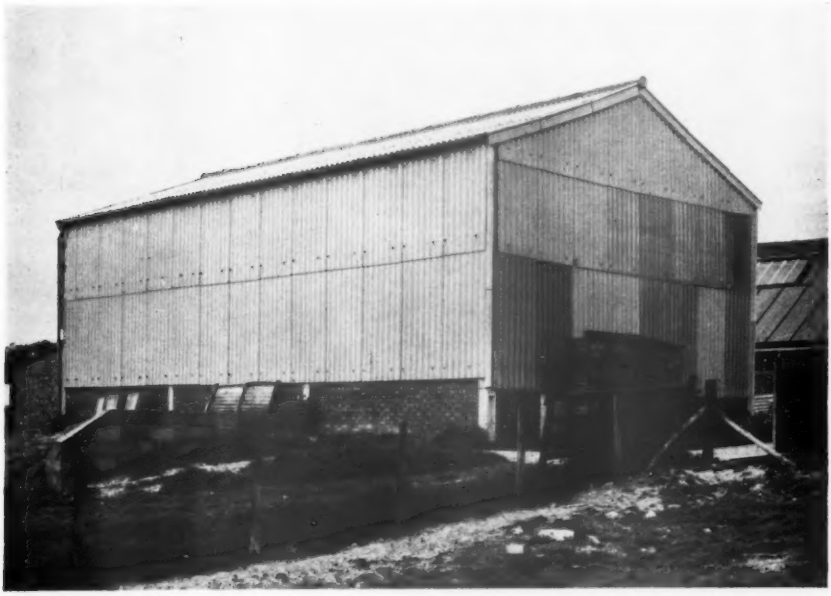


A concrete frame building roofed with asbestos and clad at the rear with demonstration panels of different kinds. The low pitch is useful when ventilation and heating have to be controlled.

Photos: *Kent Concrete Products Ltd.*

Concrete blocks and asbestos sheeting used with discretion. Detail and proportion are pleasant, but the difficulty of matching sheeting at corners and the vulnerability of down spouts are obvious.

The timber frame, Yorkshire board roof and concrete block for the lower courses of the gable end have been well chosen for function and appearance.



Photos: *The Council of Industrial Design.*

The cladding of this building, monotonous in profile and haphazard in tone, gives it the appearance of an untidy box.

Photo: *Forestry Commission.*

Hedgerow elms of various ages near Faringdon, Berks, ensure a regular supply of timber.

**Elms on the Farm** (Article on pp. 514-7)

eaves, needs much more consideration. Have you ever tried to replace a broken sheet in an overlapping course? The protection of lower courses of sheeting, the edges of cladding at corners, and of down spouts are virtually ignored. Greater interchangeability of materials to suit a wide range of needs and to make attachment of fittings easier would be a real advantage to the farmer. A softer tone of cladding for buildings which make no architectutal contribution to the landscape would avoid some of the worst clashes.

It is usually the sum total of these failings, rather than any single one, which produces the aggressively badly designed building. For instance a 22½ degree pitch looks quite well on a large span with a contrasting walling, but on a short span with the same sheets of small corrugations on roof and four walls it creates an ugly, featureless, vulnerable box. To my mind a change of tone or profile between roof and wall, and in most situations a low rather than a high tone, is preferable; although in stone areas the lighter tones can blend very well, or again, look well in a building of a dramatic, well-designed form. I have seen concrete frames and asbestos roofs look magnificent until they are clumsily clad.

## *Stimuli for improvement*

How can we achieve improvement? I do not believe that the opportunity for fine buildings will be created by controls, nor do I believe the demand for them will come from the harassed, over-worked, cost-conscious small farmer. He is too apprehensive that improvement means more expense, not less. And it will be some time before he fully realizes that inadequate buildings are one of the principal stumbling blocks to agricultural prosperity. When he does, the demand for new mass-produced farm buildings will increase still further. I believe the stimulus for improvement will come from the Ministry of Agriculture and its attitude to the administration of the grants for capital improvements and experimental buildings—I know the Ministry is taking this very seriously; and it can set an example in the buildings it erects itself.

But above all I think progress will come from a few leading manufacturers who set the pace by providing a better product within the resources of the market. I think they will do so through enlightened self-interest, and I have confidence in those with whom I have discussed this. But I do urge them to make a fundamental appraisal of the design problem and not to dress up old mutton as lamb. A design policy must be reinforced by conviction, and the merits of a better product must be sold hard in the same way as the chemical industry has sold its products to the agricultural industry. Farmers are not going to snap up better design on sight.

Furthermore the makers of the raw materials might do a great deal to sponsor improvements, and by publicity persuade farmers to take a pride in their buildings (as they do in their stock) and appreciate the importance of design to their industry. Some of the larger landowners might well be interested in co-operating with manufacturers on a long-term rebuilding scheme. The Agricultural Research Council might associate manufacturers with experimental farm building projects. The Country Landowners' Association has already shown its concern by organizing a design competition.

Architecture and building have become exportable; will farm buildings take a share of the expanding world market for agricultural equipment? It may all depend on design.

# Aphids and Aphicides

C. A. COLLINGWOOD, B.Sc.

*National Agricultural Advisory Service, South-western Region*

Mr. Collingwood writes of his experiences as an entomologist dealing with aphids in the field during the contrasting summers of 1959 and 1960.

THE past two seasons have afforded instructive contrasts in the general insect pest pattern. In 1959, very heavy aphid infestation persisted right to the end of the growing season. In 1960, frequent and heavy rain in July and August effectively restrained aphids from building up high populations. A further factor in this general situation has been the balance between predatory insects and aphids. In 1959, predators were scarce during the early months of the summer and scarcely built up to sufficient numbers to check aphid infestations by the end of the growing season. In 1960, the potential for aphid outbreaks was high; large numbers of bean aphid winter eggs were present on spindle bushes throughout the countryside, but the early summer migrant generation did not reach susceptible crops in excessive numbers owing to their decimation by such predators as ladybirds and anthocorid bugs.

The predator situation, however, is only one factor affecting aphid populations, and weather conditions at critical times are probably more important. For this reason, attempts to forecast serious aphid outbreaks well in advance have not been successful. The winter egg population of black bean aphids on spindle bushes was at one time the object of regular surveys by the entomologists of the National Agricultural Advisory Service, but these have largely been abandoned as it was found that from one year to another the July/August infestations bore little relationship to the egg populations of the previous winter. In fact regular summer surveys by advisers and British Sugar Corporation officers are necessarily carried out so that practical advice on the timely use of insecticides may be given.

## *Pattern of infestation*

Despite severe aphid infestations, the sugar beet crop of 1959 was heavy. In 1960, the direct effects of aphid infestation on the crop were slight, but the incidence of virus yellows, a disease spread by aphids, was high and beet yields in general are unlikely to achieve the record levels of 1958 and 1959. The threat of virus yellows makes early spraying essential as soon as first colonies of aphids begin to appear in the crop. At this time the more virulent green peach-potato aphid often appears in the crop, and very early attacks while the crop is still in the seedling stage—as occurred in 1957, a year of severe virus yellows—are most to be guarded against.

Similar considerations apply to that other great scourge of the farmer/grower, the mealy cabbage aphid. Numbers may be increased by vast migrations from more heavily infested centres and even from continental sources during the summer, and this is in effect what happened in 1959. Brassica crops were subjected to a continuous bombardment of flying migrants, with

the result that in many crops repeated insecticidal sprays were necessary. In 1960, rainfall in July and August over most of northern Europe has been so heavy that this pest has been of only local importance on a few crops. The position is more complicated in Brussels sprouts, in that two kinds of aphid effects must be guarded against. Early July infestation can restrict growth and so reduce final crop yield, but late infestations after the spray season is over may occur on late maturing crops and so spoil the sprout buttons.

Although it was one of the heaviest mealy cabbage aphid years on record, and despite persistent infestation and many spoilt crops, 1959 was remarkable in that later crops and final economic returns were good. Growth in 1960 has been excellent, and the main sprout areas have been remarkably free from aphids; crop quality has also been good. Judged by economic returns to the grower, however, this will not have been an altogether favourable season; in years of abundance market returns are inevitably depressed despite lower growing costs and less use of insecticides. This is the kind of difficulty that has to be faced in trying to assess the economic effects of insect pests. The Pest Assessment Committee of the National Agricultural Advisory Entomologists has computed the average annual loss to the sprout crop due to aphids in financial terms over a ten year period; the figure obtained is inevitably rather an abstraction, but is evidently sufficiently high to justify the cost of precautionary aphid sprays in almost any season. In brassica crops in general the virus situation has also to be considered. Mosaic, an aphid-borne virus disease, was noticeable in the 1959/60 broccoli crop; present indications are that it is exceptionally severe in some crops, and likely to predispose to poor stunted crops and winter kill. The general severity of mosaic will have resulted from the considerable movement of aphids in the seedbed earlier in the summer, coupled with the build-up of inoculum in surviving over-wintered broccoli of the past season.

## *Control measures and insecticides*

For Seville and spring beans as well as runners, early sprays should be applied as soon as the first black aphid colonies begin to appear. Early treatment in these crops can often be restricted to localized centres of infestation or even individual plants, usually grouped around the headlands. Early summer attacks of black bean aphid usually arise from local sources and are not reinforced from outlying areas. Early treatment, therefore, may obviate the need for spraying a whole crop later on, when much mechanical damage could result. In beet crops, similar early spraying is desirable to prevent the spread of virus yellows, but late crop spraying may also become necessary since infestations may be reinforced from summer migrations from other crops.

New aphicides are being developed, and existing materials continually tested and improved. Choice of materials will be governed by relative effectiveness, safety and price. Of these factors, relative price is of least importance to the farmer. Thus malathion, a very safe, general-purpose contact aphicide, has largely supplanted the much cheaper but more poisonous TEPP. In the long run, public demand will ensure that relative safety to user, consumer and to animal life in general will mainly determine the general use and popularity of competing insecticides. Last year severely

tested the relative efficiency of the various aphicidal materials, from Jeyes fluid to complex organophosphorous compounds. On sugar beet, demeton-methyl was generally the most effective, closely followed by dimethoate, fluoro-acetamide and phosdrin. Demeton-methyl and dimethoate have the advantage also that reasonable commercial control of beet leaf miner will also be obtained.

In brassica crops, regular vigilance rather than long range forecasts seems to be unavoidable. In the main sprout areas, spraying with the long persisting systemic insecticide schradan in July appears to be economically justifiable in most seasons, since its use will protect the crop over four to six weeks of its most important growth period. Demeton-methyl may be applied later on as a cleaning up operation where necessary. In 1959, drought was associated with growth standstill, and also with development of excessive waxiness of the leaf surface; under these conditions there were cases where schradan failed to become absorbed and translocated in the plant unless the crop had previously been irrigated. Demeton-methyl, dimethoate and phosdrin are also partly systemic in action but, unless applied at very high volumes, give little or no long-term protection. Demeton-methyl and phosdrin are in fact largely fumigant in their effect and give a quick knock-down kill even at low volumes. Dimethoate appears to require better cover and higher volume to achieve comparable results. Aerial spraying with these materials was often ineffective in 1959, since in many cases the sprays volatilized before reaching the foliage at the high temperatures then obtaining.

The insecticides so far referred to are all phosphorus compounds except fluoroacetamide, a fluorine compound of considerable interest whose full range of use has not yet been fully explored. In earlier trials this material gave as good protection as schradan on brassica crops but was less effective in the rather peculiar conditions of 1959.

Generally speaking, all these insecticides are more efficient under any circumstances when used at 60 to 100 gallons per acre, although demeton-methyl, through its essentially fumigant effect, can give good results when applied at low volumes. The present increasing use of low volume spray apparatus will inevitably favour compounds that are as efficient at low as at high volume. Other, similar insecticides, such as phosphamidon, are in process of development or have arrived on the market, but we shall not know enough about their general effectiveness as aphicides until more trial results are made known. Other methods of control, such as the implantation of concentrate systemic compounds in the soil at the base of each plant, are also being tried out as alternatives to sprays. Growers may find considerable advantages in implantation in long standing, widely spaced crops such as sprouts.

## *Less vulnerable crops*

Most other market crops are subject to attacks by various aphid species, but on the whole these present less of a major problem than the two discussed above. Carrot aphids, for example, migrate from willows in May and June to young carrot crops and frequently seriously retard growth. Systemic compounds are of little value at this time of very rapid growth in a crop of very small leaf area. The safe contact insecticide, malathion, is just as useful

in young carrots as any of the partly systemic compounds discussed above, since in any case repeated applications may be necessary to deal with successive invasions of winged migrants over several weeks. Lettuce aphids are often a considerable problem, as they may spoil the crop when it is just on the point of market. Here phosdrin is probably one of the most effective materials to use since it may be applied to lettuce within a few days of harvest. It is non-persistent and, as a penetrant requiring less thorough cover for good control, supplants the older TEPP for this kind of use. Lettuce aphids may be controlled when seen in the crop, but another pest, the lettuce root aphid, poses a different problem. Here preventive measures by way of seed dressing must be taken, and diazinon applied to the soil, as worked out by the National Vegetable Research Station entomologists, before it is known whether the pest will be a problem in that season on any particular site. Root aphids can be locally severe on dry soils in August but, generally, attacks are so sporadic that it may not be economic to take precautions for the one year out of three or more that this pest may be troublesome.

Grass aphids are occasionally troublesome, especially after mild winters, when colonies may survive to give rise to heavy infestations in spring. Numbers are sometimes so high in May and June that seed crops of timothy and rye grass may be killed out or severely damaged. Grass clumps are extremely difficult to wet, and many otherwise efficient aphicides are useless here. Demeton-methyl can give effective control through its fumigant effect, however, if the infestation is treated in time. In 1960, aphids were exceptionally numerous on spring barley crops in some areas, but no effects on final yield were discernible and insecticide sprays would clearly have been uneconomic. However, at least one of the commonly occurring grass/cereal aphids is associated with a dwarfing virus, and preliminary work by N.A.A.S. entomologists in Kent and elsewhere suggests that in some seasons late autumn sprays of demeton-methyl may profitably and effectively prevent the spread of virus in winter cereals.

Aphid infestations on potato crops in June and July may be severe but are not usually of economic consequence on ware crops. In seed crops, however, aphids are of considerable importance, because they transmit leaf roll virus. Stocks grown on for a year to produce seed outside the main seed-producing areas, which are relatively free from aphids, should be sprayed regularly with demeton-methyl, dimethoate or DDT emulsion in the early summer to prevent virus spread. Outbreaks of aphids frequently occur in chitting houses on sprouted potatoes. These infestations should be checked with BHC smokes, since there may be a risk of virus spread, while one species at least, the bulb potato aphid, may continue infesting the roots of the growing crop and so check growth in the early summer.

# Ruakura Farrowing System

## A Study in Technical Development

NIGEL HARVEY, M.A., Q.A.L.A.S., F. INST. W.S.
*Farm Buildings Unit, Agricultural Research Council*

Mr. Harvey describes the development of the Ruakura farrowing system from its origins in New Zealand ten years ago to its application on British farms today.

THE Ruakura roundhouse and its various technical derivatives are important for two reasons. First, they offer the farmer a means of meeting the peculiar needs of the farrowing sow and her piglets. Second, the story of their development illustrates with unusual clarity how the research worker, the developer and the farmer can combine to improve the design of farm buildings.

The story began about 1950 in New Zealand, where surveys had shown that between a quarter and a fifth of all piglets born died before weaning, most of these losses being due to overlying by the sow in the first week. In true text-book fashion, this "felt need" provoked the appropriate response. The investigators at Ruakura Animal Research Station listed the known ways of reducing these losses and doggedly worked their way through them. But results were disappointing.

### *First attempts*

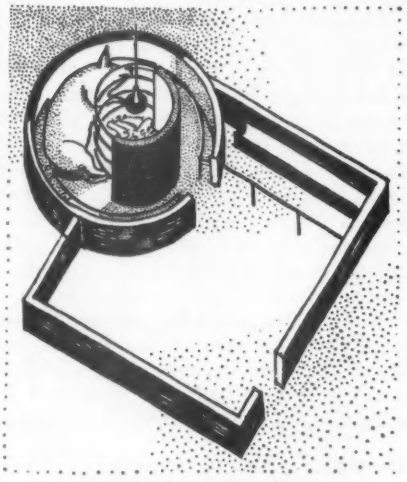
They tried farrowing rails, but found that 90 per cent of the losses by overlying occurred away from the walls, beyond the protection of the rails. They tried the sloping floor system, which depends on the assumption that sows would usually lie with their backs up the slope, so that after birth or after suckling the piglets would naturally gravitate down the slope to the protected area at the bottom. They found, however, that six of the seven sows they tested lay with their backs down the slope and one with her head down the slope, so losses were not reduced. They tried brooder lamps next but these only decreased deaths by 6 to 8 per cent, for the piglets often found their mother's heat more convenient than the heat of the lamps in the guarded corner of the pen. They tried farrowing crates, but found the labour requirements of the system to be too high for the New Zealand farmer. They tried intensive observation of the sow during the first few days of suckling, but found that heavy casualties could occur even in the relatively short intervals between the farmer's visits.

### *New start*

Some of these methods, therefore, went some of the way towards solving the problem. But none went far enough. So the research workers started all over again. Their first problem was to provide two different environments, since previous work had shown that the right temperature for sows was about 60°F and for piglets about 75°F. Their second problem was to provide the means of maintaining these temperatures which, under local conditions, meant either artificial heat, a confined space to conserve the animals' natural

heat or artificial heating *and* a confined space. Their third problem was to provide these environments in a way which allowed suckling but prevented crushing. This implied some means of controlling the movements of the sow, preferably without the assistance of the farmer.

The result of devising answers to all these problems was the original Ruakura farrowing house. The literal core of this circular design was the piglets' safety or brooder area, 3 feet in diameter. One side of this area was solid, to prevent draughts, the other consisted of two rails, which allowed the piglets free entry and exit but protected them from the sow. This brooder area was fitted with an electric heater to give the necessary warmth and encourage the piglets to stay within its protecting enclosure.



The original Ruakura type of house.

Around this brooder area was another circular area, 7 feet 8 inches in diameter, for the sow. This, however, was not concentric with the piglets' area; it was slightly off centre, thus creating a curved passage which rigorously controlled the sow's movements. She could lie down only in the part of the passage away from the door; she could lie there only with her udder to the piglets; and she could not turn round. In this way the piglets were able to move freely to the sow but the sow could not endanger the piglets in the brooder area.

For economic reasons it was assumed that artificial heating would only be used for the first week of the piglets' life. After this, the temperature of the house would depend on the output of heat from the animals. This, it was calculated, implied an air space of some 160 cu. feet, which meant a low roof, 4 feet high at the front and 3 feet high at the back. And since men as well as pigs must be considered, various types of removable roof were designed to ease the job of cleaning.

## *Practical trials*

So far the theory. What about the practice? A series of trials from 1953 onwards at experimental stations and on commercial farms in New Zealand and Australia showed clearly that the roundhouse fulfilled its main function of reducing pre-weaning losses. At Ruakura, for example, losses by crushing averaged 6 per cent in traditional housing and only ½ per cent in the roundhouse; at Cressy Experimental Farm in Tasmania, 17 per cent and 15 per cent in different types of conventional house and 9 per cent in the roundhouse—though at Cressy the best results came from farrowing stalls, where losses averaged only 2 per cent.

More general experience showed the need for certain improvements in detail. For one thing, there was difficulty in keeping the temperature suffi-

ciently high in the brooder area. This was overcome by replacing the earlier, part solid, part rail enclosure around the piglets' safety zone with an insulated wall, leaving only a 10 inches creep space for the entry and exit of the piglets, and fitting this house-within-a-house with an insulated cap. For another, some sows continued to lie with their backs, instead of their bellies, towards the piglets in the brooder area, so fittings were added to discourage them from lying in the wrong position. Thus the improvers followed the developers, even as the developers had followed the research workers. The results, it seems, satisfied the final test of all—the test of commercial use. By 1960 one New Zealand adviser had been personally concerned with erecting over five hundred houses of this type in his district.

Meanwhile the roundhouse was making its appearance overseas, where it showed itself capable of adaptation to a variety of different conditions. In 1956, a form of the Ruakura house designed for tropical conditions gave good results in Fiji. Three years later, a portable plywood version was tested in the bitter cold of a Manitoba winter and was judged "superior to many existing farm buildings which are used for farrowing, though inferior to a properly designed and equipped farrowing barn". There were, however, losses from chilling and crushing, for the Canadians failed to appreciate the lessons of New Zealand experience. The brooder area of the Manitoba house consisted only of a light shield and protecting rails. It was not substantial enough to retain heat and so attract the piglets by providing a temperature well above that of the rest of the house.

It was in this period that the roundhouse came to Britain, where once again it had to answer the questions that face any new applicant for a place on the farm. There are, unfortunately, no accounts of its introduction into this country, and no figures of its spread and present incidence. But there is sufficient published evidence to reconstruct some of the story.

## *Ruakura house in Britain*

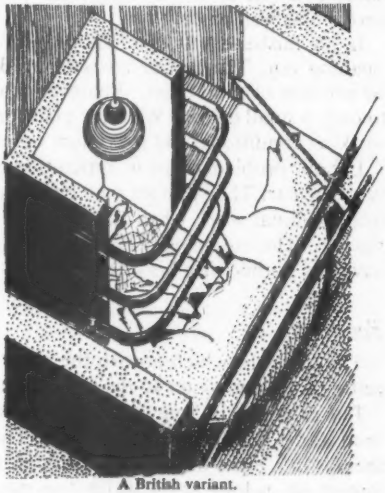
The first question was obvious. Did it work under British conditions? This could only be answered by fairly lengthy tests with proper controls; in other words, it was a matter for the research station rather than the commercial farm. So two sets of trials were held, one at Writtle Agricultural Institute, the other at the West of Scotland College of Agriculture. At Writtle, the death-rate was 11·7 per cent in the Ruakura house, 15·6 per cent among litters by the same sows in conventional farrowing pens. In Scotland, however, mortality in the roundhouse averaged 23 per cent, which was about the same as that in the conventional houses on the college farm. These results were not startling, but they were sufficiently favourable to encourage further development.

The second question was less easy to answer in direct statistical terms. How did the Ruakura house fit into the existing system? For, clearly, the roundhouse needed considerable adaptation if it was to suit many British farmers. It was designed for an outdoor system, whereas most farmers in this country prefer an indoor system; it was more expensive to build than the traditional pen; and in any case farmers wanted to adapt existing buildings rather than spend money on new ones. Equally clearly, such adaptation was not really a matter of research in the strict sense of the word. It was a matter of applying known principles, known data and known building materials

to a general type of need under specific sets of physical and financial circumstances. It was a matter of trial and error, of 'fiddling and fixing'. So we find that greater use was made of the *principles* of the Ruakura house than of the house itself, and that much of the work of applying these principles to particular needs was undertaken by individual farmers and individual firms.

## *British developments*

Some of these, continuing the open-air tradition of the original houses, have devised simple round farrowing huts which exclude the corners that allow no escape for the piglet trapped by the sow. But most of them have applied themselves to a new form of the old problem of fitting a round peg into a square hole. On the one hand, the circular principle was essential to the Ruakura system; on the other, British pens remained obstinately rectangular. So various types of frame and crate have been designed to fit inside pens of the traditional type.



A British variant.

In detail, these designs vary a good deal, but they have several features in common. They preserve the central brooder area, in most cases assuming that it will be artificially heated; they preserve the curved enclosure which restricts the movement of the sow, though they reduce it from a circle to a semi-circle and may use cut-off corners instead of rounded walls or railings; they allow freedom of movement to the sow and her litter outside the farrowing accommodation, even if it is limited to the remaining space in the pen; and they do all these things in cheap and simplified form. But they do not include the strict control of temperature which was one of the main features of the original Ruakura house. It would be interesting to know how their performance compared with that of the early type of house and of conventional farrowing accommodation. So far, however, only one report on the subject has appeared. This comes from the Agricultural Research Institute of Northern Ireland, where one of these modifications of the Ruakura system proved "very successful" and reduced piglet losses to 7 per cent. Apart from this, no formal evidence on the effectiveness of the different efforts to adapt the Ruakura principles to British conditions is available.

This story has various lessons. The first is the sheer amount of work involved in developing new types of farm building. The second is the mutual dependence of the research worker, the designer and the builder or the equipment-manufacturer on each other's skills. The third is the dependence of all of them on the decisions that the farmer makes on the evidence they provide. For in matters of technical development it is the farmer who is the ultimate judge.

# Labour and Pigs

J. R. LUSCOMBE, N.D.A., N.D.D.
*Harper Adams Agricultural College*

Within limits, please the pigman and you please the pig. Plan for a minimum of manual labour, good working conditions, and leave your stockman as much time as possible to observe the stock.

ANIMALS require an observant attendant who can almost anticipate troubles which reduce efficiency. It is also obvious that if the stockman's routine occupies all his time and energy, he will not be able to ensure that the animals perform as well as they can.

In pig husbandry it is not simply a question of saving time on feeding and cleaning out. The labour costs in producing a 200 lb bacon pig represent 10 per cent of total costs. Whatever economy is effected can influence profit to only a small degree. We must plan for minimum manual labour, amenable working conditions, and maximum opportunity to observe the stock.

Labour problems exist in agriculture generally, and in livestock production in particular. The younger men entering the industry today are not prepared to do manual work when they know that there are machines which will do the job. The employer who provides labour-saving equipment is going to have less bother with his workers.

## *Feeding*

The two jobs which absorb the most physical effort in pig production are getting food and water to the animals, and removing their dung and urine.

For example, 100 pigs at 100 lb live weight will need approximately 400 lb food and 1,000 lb water every day. The easiest method of getting water to them is in a pipe; whether this terminates in a self-filling bowl or a tap is not important, as long as the water does not have to be carried. The meal may be taken in a trolley or buckets. Here there is a clash between saving time and effort and efficient management. It is vital that the conversion rate be checked at least once a fortnight. This means that the weight of meal fed must be fairly accurately known.

It is false economy to reduce the time taken to feed pigs. You must see that they have cleared up from the previous meal, that the trough is clean and that they all come to eat with gusto. Some devices exist which convey the meal to the pigs merely by pressing a button. In this case the man in charge must be as much a mechanic as a good stockman: seldom are these two qualities found in the same person.

Using self-feeders which need refilling once or twice a week does save some time each day, but does not reduce the amount of meal that has to be carried to the pigs. In fact it may increase it, as *ad lib.* fed pigs consume more than those fed twice daily. Also *ad lib.* feeding with animals of average performance as judged by present methods of carcass assessment gives pigs that are too fat for bacon but quite acceptable as heavy pigs. Labour would not be the deciding factor when choosing between bacon and heavies. The

heavy pig is three weeks or so longer than the baconer is getting to killing weight, and this may offset the economy effected by *ad lib.* feeding.

### *Dunging out*

Dung handling presents a more difficult problem. The 100 pigs consuming 400 lb meal and 1,000 lb water will excrete this quantity, minus that retained for liveweight increase and some lost in respiration, leaving at least 1,200 lb dung and urine. The tendency in piggeries today is to handle this in one of two ways: by using straw and allowing an accumulation of muck over a few weeks which can then be moved with a fore-end loader, or by using no straw and treating the material as sludge. There are several vacuum tanks available on the market which deal with this quite effectively. A collecting tank is necessary, the size of which will be determined by the frequency of emptying. It is not always convenient or possible to take the sludge out on to the land, so it is safest to allow two weeks' storage.

The 100 pig unit will produce about 100 gallons of sludge per day—16 cu. feet, or 0·16 cu. feet per pig per day. Storage capacity for a fortnight would be 224 cu. feet, or say a tank 6 feet × 6 feet × 6 feet.

When installing this system, gravity should be used wherever possible to get the dung and urine away from the pigs. A slope of 1 in 10 on the dunging passage floor will enable it to be moved with the aid of a squeegee. This slope should be towards the wall, and not lengthways. A 3-inch gap underneath a part of the wall leading out into a covered channel is practicable. Slats are becoming popular, and may greatly improve the sludge system; they are rather expensive to install, however.

These are a few pointers towards reducing manual labour; how can we obtain amenable working conditions? Unfortunately, there is again a clash between what is best for the pigman and what is best for the pig. For the pigman one large house is ideal; but this would make it most difficult to keep disease at a low level, and so the overall health of pigs would be bound to suffer.

For the pigs, outdoor farrowing and fattening in small units ensures good control of disease, but attending to sows and litters on a cold wet day in January is not conducive to a happy pigman. It is true that with the intensive system one man can look after more pigs. A unit of 50 sows and litters covering 10 acres can be managed efficiently by one man. At £10 a week wages and 15 pigs weaned per sow per year this gives a labour charge of 13*s.* 4*d.* per weaner. Intensively he might manage 60 sows; this would reduce the labour charge per weaner by approximately 2*s.*, which is less than the value of one pound of live weight. If by using the outdoor system one gets heavier, healthier piglets the extra charge is more than justified, provided that a pigman can be persuaded to work the system.

Finally the requirement of maximum opportunity to observe the animals must be fulfilled. This applies more particularly to pigs on self-feeders, where the stockman may refill the hoppers only twice a week. Easy access to the pen is necessary; doors which open and shut conveniently, and an adequate supply of either natural or artificial light is essential. It should be a pleasure to go into the pens and not a frustration.

Only by providing conditions which suit the pigman shall we get the best from both man and animals.

# Machinery at the Royal Smithfield Show

CLAUDE CULPIN, O.B.E., M.A.
*Ministry of Agriculture Fisheries and Food*

Cattle were absent from Smithfield for the first time since the Show began in 1797, but the latest developments in farm machinery were there in full force.

IT did not require the accident of widespread foot and mouth disease to prove the importance of Smithfield as a show of farm machinery. Smithfield had already become firmly established as the show where it is possible to see under one roof a representative selection of the wide range of modern equipment, where visitors from overseas come annually to see what we have to offer, and where new developments are unveiled.

The economic importance to individual farmers of a wise choice of equipment can hardly be overstated. Efficient mechanization is already the most important management factor on a wide range of farms, and there can be little doubt that in future its importance will increase. Continued success in mechanization policies requires knowledge that is always up to date, allied to discretion on when machines should be replaced, and good judgment concerning likely future developments. A regular visit to Smithfield can do much to provide the knowledge on which these desiderata must depend.

The hydraulics incorporated in tractors have become as important as the engines and transmissions, but are unfortunately not quite so well understood. This year, one more of the most commonly seen tractors incorporated automatic hydraulic draft control, along with other refinements in implement control; and it is now generally accepted that an efficient built-in "weight transfer" device is essential to a modern wheeled tractor. A device that can secure this advantage with four-wheeled trailers and trailed implements is an important development. Disc brakes and a differential lock are clearly destined to become standard features of tractor design. A new tractor exhaust brake is a safety feature that will appeal to farmers on hilly land, once its performance is appreciated. Progress in mechanical handling was evident everywhere. The carrier or tanker sugar beet harvesters are a logical development that is sure to become widely accepted.

The one-row p.t.o.-driven hay tedders are cheap, simple, and on the whole very effective. It was encouraging to see that a manufacturer has thought of providing for use of the machine at the same time as the mower. We now know that the crimpers and roller crushers can do good work in our conditions, but we need more field experience to decide in what circumstances buying such a machine is economic.

Semi-automation about the farmyard is developing steadily. The small cuber has now been successfully linked up with the automatic mill-mix arrangement, and it was satisfactory to find that including the cuber need not mean scrapping existing equipment.

Machinery for push-button stockfeeding and manure removal is being steadily developed. There is no doubt about its being economic in some circumstances—for example, for large-scale intensive poultry keeping. On the other hand, push-button methods for cattle feeding still have to prove themselves economic in British conditions. For those farmers who are reasonably satisfied that self-feeding silage suits them best, there were a few simple aids, such as a ready-made tubular feeding barrier, and a slurry scraper designed to fit on the tractor's three-point linkage.

Altogether, Smithfield left the impression that the agricultural machinery manufacturing industry is in good fettle.

# National Poultry Show

W. M. ALLCROFT, B.Sc., PH.D.
*Ministry of Agriculture, Fisheries and Food*

THE fifteenth National Poultry Show was held at Olympia on 7th–9th December, 1960. Despite the existence of disease there were some 2,000 birds in the exhibition classes, and some 500 entries in the table carcass classes. The bulk of the show space was occupied by trade exhibits of feeding-stuffs, drugs, housing and equipment and some livestock. There was an official Ministry stand, combining the bookstall and an inquiry bureau, and the Department of Agriculture for Scotland also had a stand. The Poultry Diploma Board had a stall dealing with education and careers in the poultry industry, and the leading organizations had taken space where their representations were available. The trade exhibits included a number of new features, ranging from fowl drinkers to windowless houses. An interesting feature was the extent to which a number of firms were paying attention to the intensive production of commercial rabbits for meat. It seems that this industry is developing just as fast as they can multiply the breeding stock, and in the rabbit this should be quite fast!

Inquiries revealed that trade at the show had been generally good in all sectors.

At intervals there were demonstrations of a table poultry processing plant, turkey processing and packing, carving poultry, and other items of interest. For the ladies there were demonstrations of the making of flowers from poultry feathers and a display of the winning entries from a nation-wide competition for making hats from feathers. Many of the breed societies took the opportunity of holding their meetings at the show.

For those with inquiring minds, Convention meetings organized by some of the leading associations covered a wide range of subjects. On Wednesday the British Broiler Growers' Association heard about controlling respiration infection, and the Poultry Education Association had a meeting to discuss commercial rabbit production. On Thursday the Poultry and Egg Producers' Association of Great Britain had a discussion on adjusting traditional methods of breeding and egg production to meet present day developments; the U.K. Branch of the World's Poultry Science Association heard a debate on the vexed question of commercial compounding versus home mixing with economics of poultry nutrition, and the British Egg Marketing Board held an open forum on what eggs for the shopping basket. On Friday the Accredited Poultry Breeders' Federation discussed the future for poultry producers: integration or co-operation. These meetings were well attended, and discussion at times was lively: they are most valuable. The National Federation of Young Farmers' Clubs held two competitions, one for poultry plucking and trussing and the other for poultry carving. There were forty-four entries in all, and a good number of people watched the judging.

The attendance was better than the previous year. The overall value of the show to the poultry industry and all its ancillaries must be enormous—it is the main shop window of the poultry industry—and great credit is due to those who worked so hard to make it a success.

# 33. Middlesex

J. HARDY, N.D.H.
*County Advisory Officer*

THOSE unfamiliar with the county think of it as chiefly bricks and mortar, but to those who work its farms and nurseries it is rich in tradition, with many interesting remnants of its original rural character and containing the finest soil in Britain. Its horticultural history is as old as the industry itself, and the present generation of growers are reaping the benefit of the good work of their forefathers.

"An acre in Middlesex is better than a principality in Utopia" said Macaulay. Obviously he had great foresight, as apart from the abounding fertility of the land, its sterling value has risen beyond reckoning, and what cost £80 an acre in 1883 will sell today for £12,000.

The rich Thames Valley gravel and brick earth soils of south Middlesex were for generations lavishly dressed with "London muck", while in Roman times a large part of the Thames Valley was planted to fruit and vineyards. Not until the sixteenth century were the real foundations of commercial horticulture laid down.

About eighty years ago a rapid expansion of the market garden industry took place to meet the increasing demand in London for fresh vegetables and salads. At the turn of the century the prospects of glasshouse cropping were realized, and tomatoes, cucumbers, roses, carnations and pot plants were introduced. Revolutionary ideas in glasshouse construction, design and heating were sponsored, metal houses built in 1860 were superseded by timber, and eventually the area of glasshouses grew to several hundred acres.

Throughout the eighteenth and nineteenth centuries farmland was increased by the felling of large tracts of woodland, and the heavy London clays of north Middlesex produced excellent corn crops and hay. What has become the Green Belt today is now occupied by farms of 150–400 acres, heavily stocked and highly fertile, mostly dairy farms with the Friesian dominant, but still capable of two tons of grain per acre.

Lying to the north-west of London, the county is bounded at its southern end by the Thames Valley, on the west by the Colne Valley, and in the north-east by the river Lea. The pleasantly undulating Colne Valley with its Chalk outcrops and black, alkaline, silty peat can compete with any Fenland area's production figures. While much of this area is now under corn and grass, it has in recent times produced 44 tons of carrots per acre. The glacial drift appears on the hills in north Middlesex, forming a ridge to the London basin and its clay, but eastwards the Lea Valley has for years supported a highly productive glasshouse industry on soil of a similar nature.

Middlesex lies at 50–500 feet above sea level, and Harrow Hill (420 feet) is almost the highest point looking eastwards in a straight line before reaching the Ural Mountains.

Although the county covers a mere 148,910 acres and is no more than 20–25 miles across its width and about 40 miles from north to south, it houses a population of 2,247,000 people, and within its boundaries is found a large range of crops. It is the most important gravel-producing area in the country, with an annual output of some 4 million tons. The problem of reclamation is immense. Great strides have been made during recent years and large tracts of filled-in pits are about to return to agriculture. Brick-making is not as extensive as formerly, but the presence of brick earth has been of considerable value to chrysanthemum growers and market gardeners in the areas concerned.

There is little doubt that Middlesex has continued to thrive because of its proximity to good wholesale markets. Covent Garden is still the main outlet for disposal of produce but Brentford, within the county, is fast becoming a major market for flowers as well as vegetables.

Whilst fruit-growing is no longer of any consequence, it is notable that Cox's Orange Pippin was raised by Richard Cox at Colnbrook in 1830; and in more recent times seed-growing firms have contributed many standard varieties of vegetables, salads and flowers.

The county's climate is relatively mild, with an average rainfall of 24 inches, but long dry periods are frequently experienced in early spring. The demand for irrigation water is tremendous; almost all market gardens are irrigated, and lettuce production for London markets is enabled to continue all the year round with justifiable results.

London Airport deprived the county of 1,500 acres of its most fertile soil. Fortunately, development restrictions around the airport have influenced the retention of many useful holdings which continue to produce excellent vegetable crops.

The farmland is mainly concentrated around the north and north-west of the county and, like its horticultural counterpart, has been pushed gradually westward and northward by the demands of the developers. It is good land, supporting excellent Friesian and Shorthorn dairy herds, with an occasional heavily stocked beef unit. As would be expected, farm buildings have improved considerably during the past decade, and these neat pleasant farms provide a very rural background to an otherwise urban area. There are few sheep, but the pig population is extremely high and, with ready sources of supply at hand, it is invariably swill-fed. Naturally, the bulk of the pigmeat is raised on "concrete", and with several large manufacturers within easy reach, this section of the industry is both lucrative and enterprising. Egg production is a sideline on most agricultural holdings and, again, a large and immediate market makes it worth while.

The heavy soil on which the farms are situated produces good grass, and the maximum use is made of first-class hay and an increasing quantity of silage. Milk production is at a peak; several large dairies run their own herds to augment supplies.

Middlesex is a county packed full of interest, and there is always something worth while to be seen and done. Much of the remaining soil is as valuable for intensive cultivation as any in England, but urban and industrial interests often have to take precedence over agricultural ones. Provided the present restrictions continue to be imposed, there may still be many acres left of this highly fertile soil.

*At the Farmers' Club*

# The Importance of the Time Factor in Grazing

M. ANDRÉ VOISIN, farmer-scientist from Normandy, talked to the Farmers' Club about the basic principle of rational grazing, on 14th December. This he defined as the time factor. Although, he said, the importance of allowing adequate rest periods between successive cuts is well known and generally practised with mechanically harvested crops, the principle is usually ignored when the grazing animal harvests a sward. Yet this basic principle applies equally well in these circumstances. Neglect of the rest period for grass dates back little more than two hundred years, and is a consequence of the enenclosure of common grazings. Before then, it was customary to tether grazing animals, or to use a sheep dog as "a living electric fence". These systems restricted grazing to swards which had reached the desired stage of growth.

M. Voisin insisted that just as an experienced farmer can tell when a lucerne or clover crop is ready for cutting, simply by looking at it, so he should be able to develop a similar eye for recognizing the ideal stage of maturity for grass intended for grazing. Except at the beginning and end of the season, he said, this stage corresponds to an average height of six inches for permanent pasture and eight inches or more for a temporary ley.

Another aspect of the time factor relates to the period for which a paddock is grazed. "Even if grass is allowed the desirable and variable rest periods between any two grazings, the greater part of the advantage thus obtained will be lost if the herd, in each rotation, is allowed to graze a paddock long enough for a plant to be sheared twice, or even oftener, in the course of the same period of occupation of that paddock . . . Unfortunately, the importance of a sufficiently short period of occupation (let us say about five days) has been much neglected up till now in the various systems of grazing, whether rotational or rationed."

If the period of occupation is relatively short, and the rest periods sufficiently long and variable between each grazing, the grass will be sheared by the herd only five or six times a year, compared with the twenty or more shearings it suffers under continuous grazing. The corresponding increase in yield obtained by the former regime will be analagous to that obtained when lucerne is cut three times annually rather than ten times. In Austria, work by Zorn has shown that by reducing annual rotations from eight to six, annual grass and S.E. production was doubled and the yield of crude protein increased by 40 per cent.

"I believe that we must face the fact that our feeding tables are based on insecure foundations", declared M. Voisin. "Until progress has been made with our scientific methods, the animal and not the chemist will remain the supreme judge of the value of grass and our methods of growing it." He emphasized the tragic mistake of feeding animals exclusively on very young

grass, erroneously believed to be rich in protein. The cow expresses her own opinion of such grass by seeking desparately for coarser herbage in banks and hedgerows, for the very young grass is much too rich in nitrogenous compounds as compared with carbohydrates, and also deficient in fibre, thus preventing rumination.

Under continuous grazing carried out over large areas of grass, the grazing animal has both young and mature grasses at its disposal, and can harvest for itself a grass "cocktail" of fairly well balanced nutritional value.

Although young grass containing 17 per cent crude protein and 18 per cent fibre appears to be a high-quality food according to our feeding tables, it forms excessive amounts of ammonia in the rumen. Twelve days later this grass will contain only 13 per cent crude protein and 26 per cent fibre, and will produce three times less ammonia in the rumen liquid. Part of the excess rumen ammonia is converted to urea and other nitrogenous substances which are lost in the urine. Thus, although young grass is rich in crude protein only a very small fraction of the nitrogen it contains is utilized by the animal.

M. Voisin advanced the theory that excessive rumen ammonia gives the cow "something akin to stomach cramp", and that she has discovered that the pain can be eased by eating more mature herbage.

He then defined good grazing as "satisfying as far as possible the requirements of both grass and animal", both of which are obtainable by allowing sufficiently long rest periods. Observation of the time factor allows us to increase the yield per acre of grass and nutrient elements, and to provide the animal with high-quality feeding.

Transition from stall feeding to grazing must be gradual, and the young spring grass supplemented with ample dry matter and fibre. Paddocks to be used at the beginning of a new season should not be grazed bare at the end of the previous year, so as to leave some coarse herbage to balance the tender young shoots.

Nitrogen fertilizers not only increase grass yields but also help to get more regular production throughout the season. Unless applications are governed by the all-important time factor, however, many disorders may result among the stock. When animals graze very young grass, the excessive ammonia produced in the rumen passes into the blood stream, overtaxing the liver causing it to deteriorate and degenerate, and also inducing hypomagnesaemia. But if sufficient time is allowed for the grass to build up true proteins from the nitrogen dressings, these dangers are correspondingly reduced, and large dressings can safely be used.

SYLVIA LAVERTON

# THE MINISTRY'S PUBLICATIONS

Since the list published in the December 1960 number of AGRICULTURE (p. 486), the following publications have been issued.

## MAJOR PUBLICATIONS

*Copies are obtainable from Government Bookshops or through any bookseller at the price quoted.*

### BULLETINS

No. 10. Calf Rearing (Fourth edition). 3*s.* (by post 3*s.* 4*d.*)

This bulletin is a new review of an old subject which will be of interest to all concerned in calf rearing. It covers nutritive requirements, management, feeding, housing for the young calf and calf disorders.

### OTHER PUBLICATIONS

Farm Incomes in England and Wales 1958. (Including a comparison with 1957 and some reference to earlier years.) Farm Incomes Series No. 12. A Report based on the Farm Management Survey. (New) 6*s.* 6*d.* (by post 7*s.*).

Food Standards Committee Report on Bread and Flour. August 1960. (New) 4*s.* 6*d.* (by post 4*s.* 11*d.*)

## LEAFLETS

*Up to six single copies of Advisory Leaflets may be obtained free on application to the Ministry (Publications), Ruskin Avenue, Kew, Richmond, Surrey. Copies beyond this limit must be purchased from Government Bookshops, price 3d. each (by post 5d.)*

### ADVISORY LEAFLETS

No. 224. Red Spider Mite on Glasshouse Crops (*Revised*)

No. 263. Tomato Leaf Mould (*Revised*)

No. 454. Seeds for Leys (*Revised*)

No. 483. Insect Pests in Food Stores (*New*)

No. 485. The Pollination of Plums (*New*)

No. 486. The Pollination of Cherries (*New*)

No. 492. The Saw-Toothed Grain Beetle (*New*)

## FREE ISSUES

*Obtainable only from the Ministry (Publications), Ruskin Avenue, Kew, Richmond, Surrey.*

### FARM SAFETY REGULATIONS

Stationary Threshers and Balers—Explanatory Note (*New*)

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### AGRICULTURAL TALKS

The report on the talks arranged last May between the U.K. Agricultural Departments and the Farmers' Unions of England and Wales, Scotland and N. Ireland, has been published as a White Paper, Command 1249. It is available from H.M. Stationery Office or through any bookseller, price 9*d.* (11*d.* by post).

# In Brief

### CHAROLLAIS CATTLE

In reply to questions in the House on 8th December about the Terrington Report,* the Minister of Agriculture said:

"The Secretary of State for Scotland and I have carefully considered the Committee's report, and have taken into account the views of all the organizations concerned. We agree with the Committee that there is a good case for a trial of some Charollais bulls imported under the strictest veterinary control.

"The Secretary of State and I are satisfied, from the expert advice available to us, that with the extremely strict precautions which would be taken there could be no risk of introducing disease into this country. We have, however, to take into account the possible effect upon the international livestock trade if the proposed importation of Charollais from France were proceeded with at this juncture.

"While, therefore, we accept in principle the desirability of trying the Charollais experiment at a convenient opportunity, we are not proposing to proceed with the importation for the time being. In the meantime we shall do all we can to demonstrate that no risk is involved in our experiment to justify any restrictions on our exports.

"We are very much indebted to Lord Terrington and his Committee for the careful thought which they gave to this subject and for their very helpful report".

### NORFOLK AGRICULTURAL STATION

The average yields of commercial crops grown at the Norfolk Agricultural Station, Sprowston in the exceptionally dry year of 1959 and the preceding wet season of 1958 show the usual effects of dry years on yield, but the yield differences, except for barley, were not as great as might be expected.

In 1959 the yield of spring barley, 32 cwt per acre, was double that in the wet 1958 season, whereas wheat and vining peas did only slightly better in 1959 than in 1958. Sugar beet, however, yielded only 12 tons per acre in the dry year, as against 16·75 tons per acre in 1958.

These observations occur among many other points of interest in the 52nd Annual Report of the Station, in which the results of Sprowston field experiments are always translated into terms of practical farming. For example, it is shown that in the Sprowston area the equivalent of about 4 cwt of 15 per cent Nitro-Chalk is about the right level of nitrogen manuring for Atle, Svenno and Koga II spring wheats. Similarly, trials with spring barley showed that not more than 2 cwt of Nitro-Chalk should be used after peas, potatoes or sugar beet, and it should be applied on the seedbed or as soon as possible after hoeing.

There is a very interesting account of trials of fertilizer placement with chitted and unchitted seed potatoes, showing that chitted seed is more readily damaged through contact with fertilizer, so that much of the advantage of placement is lost with chitted seed if fertilizer is allowed to come into contact with the tubers.

Another practical point: periodic lifting trials with sugar beet show that as the tonnage of roots increased over the early lifting season so their sugar percentage fell, but the combination of the two effects resulted in an increase in sugar yield until mid-November, when it fell slowly to the end of the season.

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*A note on the findings of the Terrington Committee, headed *Charollais Cattle*, appeared on p. 380 of our October issue.

Experiments which have not reached the final stage are also reported. These include examining possible methods of reducing the spring labour peak in beet growing, the testing of sugar beet strains tolerant of virus yellows, and also tests with herbicides for this crop.

The use of sprouted seed is being investigated in a potato trial which is on the same plan as an experiment at Terrington Experimental Husbandry Farm. This compares chitting for various periods before planting; some of the tubers are started quickly in autumn and then held at a temperature low enough to stop growth until the following spring. Previous work has shown that less sprouts per tuber result in fewer but larger potatoes, and it may be that by early chitting and so encouraging the single apically-dominant sprout which is produced when potatoes have undergone an initial dormant period, the growth of further sprouts will be depressed.

Placement trials with vining peas, now in their fourth year, confirm that there is no advantage from placement of fertilizer as against broadcasting it, and that where nitrogen was applied crops maturity was delayed and yields were somewhat reduced.

A. J. L. Lawrence.

## BEEF AT TWELVE MONTHS

Before the war, the traditional "roast beef of old England" invariably came from a three-year-old bullock weighing approximately 15 cwt. Rationing and smaller families created a demand for smaller joints. As a result, store beasts have been finished at between eighteen months and two years, weighing about 10-10½ cwt. More recently, some producers, particularly in eastern England, have turned their attention to the possibility of producing a finished beast in twelve months.

The system is relatively simple. Good, beefy, quick-growing calves are bought at a week old. For the first few days they are fed on milk substitute, but concentrate feeding is introduced to them within a week and gradually replaces the milk. At the end of five weeks, the calves are fed completely on solid food. The ration is gradually increased from 5 lb of a concentrate mixture per head per day at five weeks, to 12 lb for the last two months. The beasts are then sold fat at twelve months, weighing 8 cwt.

Opinions differ as to whether hay should be fed at an early age. Some producers wait until the beasts are three months old: others introduce it within the first week. As a guide, however, if hay is not fed from the beginning it is advisable to feed a grass meal concentrate mixture in the early stages rather than the more usual rearing nuts.

But feeding is one of the lesser problems of this system. In the early stages, the calves are fed "according to the book", usually on a proprietary food. After three months, when a home-mixed balanced ration can be fed, the aim must be an intake of concentrates sufficient to maintain an average liveweight gain of 2¼ lb per head per day. The system, as so far described, implies that all the calves will make the grade at twelve months. Unfortunately this is by no means the case, and success or failure depends largely on the performance of the beasts. With this in mind, would-be producers might consider the following points.

Calves should be bought in small batches of ten or twelve. This will enable the farmer or his dealer to select calves far more critically than if he were purchasing 40 or 50 at a time. Weak, suspect-looking calves should be avoided at all cost, for a low buying price is no quick road to success. It would be more sensible to pay a couple of pounds a head over the odds to acquire the ten best calves in the market than to pay the market price for a bunch of all sorts.

Skill in selecting good doers in the market must be followed up on the farm by periodic weighings to ensure that the farmer's initial judgment was correct. Each

calf should be weighed at 8 weeks of age, and its subsequent ration adjusted according to its current performance. This is, in fact, the time to separate the sheep from the goats. An average liveweight gain of 2½-3 lb per head per day during the first eight weeks would justify intensive fattening in twelve months. The culls, who do not reach this standard, should be fed on more traditional lines and finished in eighteen months, or sold as early stores. Subsequent weighings, every two months, are necessary so that the ration can be adjusted to ensure a live weight of 8 cwt at twelve months.

Finally, hygiene is vital if unreasonable casualties are to be avoided. For this reason, it is unwise to buy more than 6 batches a year, so that the calf pens can be free of stock for at least three weeks between each batch. During this time, the pens should be completely disinfected, all litter removed and feed troughs scrubbed ready for the next batch. As a further precaution it is advisable to pen the calves individually, rather than in groups, during the first five weeks.

Successfully managed along these lines, this system of beef production can be quite attractive, with a profit potential of between £8 to £10 per beast when all costs, including labour, have been covered. If the farmer himself looks after the calves, profit can be increased by a further £3 per head.

The system might well appeal to the small farmer, running his farm on intensive lines and devoting all his land to cash cropping. The land requirements of the system are nil, and the capital costs of building alterations small. It also involves a quick turnover of capital, and has the further advantage of flexibility. Advantage can quite easily be taken of favourable store prices, and the farmer is not irrevocably committed to one market, as often happens with other systems of beef production. But "early beef" calves cannot be regarded as grazing stock, and on grass farms they would form an additional, rather than a supplementary, livestock enterprise. For the whole twelve months they are comfortably housed in pens, boxes or yards; the setback which results from being turned out to grass would seriously affect their performance rate, while hand feeding of 6–7 lb per head per day of concentrates would be necessary to supplement the pasture—an expensive, unattractive method of summer fattening.

P. G. James.

## MATERIALS HANDLING ON THE FARM

"Farming is largely a transport industry." We all recognize the truth of this, for we all know in a general sort of way that a substantial part of the energy available on the farm is used for moving materials of various sorts from place A to place B. But hitherto there have been few studies of this important and expensive item in agricultural costs. Indeed, there has been comparatively little interest in the whole subject of materials handling in agriculture. Three recent work study reports from Scotland are, therefore, of particular value to all those concerned with planning and managing farms. They state the problem clearly, illustrate it in a detailed, practical way, and describe the principles and procedures for dealing with it.

The first two of these reports analyse materials handling on a 100 acre West Country dairy farm and on a beef/arable farm of the same size in eastern Scotland. On the dairy farm, the total amount that required handling annually was 1,200 tons; on the mixed farm 600 tons. But owing to the number of times different materials were handled, the amounts actually moved every year were 9,000 and 6,000 tons respectively. Indeed, the findings on the number of times various heavy and awkward materials were moved are disconcerting—dung was moved four to six times, silage ten times, potatoes fifteen times, and hay up to twenty-three times.

At first sight, the answer lay in the use of improved handling methods, including the greater use of machinery. In both cases this secured considerable and very valuable reductions in the amount handled. But such a remedy dealt with symptoms instead of causes. The basic question was not "how can this amount best be moved?"

but "how can the amount to be moved be reduced?" So more fundamental alterations in farm policy were suggested and discussed in detail, and their effect on the handling problem shown. By such means the amounts handled annually were reduced on the dairy farm by two-thirds, on the mixed farm by one-third. The writers of the reports concluded that "materials handling on many farms is excessive and could be greatly reduced by a logical approach to the subject. Even without radical changes, the principles of materials handling properly applied will provide worthwhile savings on any farm." These principles are described graphically and amusingly in the third booklet.

Copies of these booklets, *Dairy Farming*, (SAI-AWS-6), *Beef Arable Farm* (SAI-AWS-7) and the *Materials Handling on the Farm: The Principles* (SAI-AWS-5) are obtainable, free, from the Agricultural Work Study Unit, Scottish Agricultural Industries Ltd., 39 Palmerston Place, Edinburgh 12.

Nigel Harvey

## REGISTER OF AGRICULTURAL EVENTS, 1961

In response to many requests, the Royal Agricultural Society of England has agreed to publish an annual list of agricultural demonstrations and conferences, both national and regional, to be staged in Great Britain and Northern Ireland.

The intention is that the list shall be produced in December of each year, and that it will be revised and be brought up to date quarterly.

The Society will be glad to hear from the organizers of such events and to supply forms for the submission of details. Its address is 35 Belgrave Square, London, S.W.1.

## CLEAN COWS AND CLEAN MILK

Dirty cows and clean milk are incompatible, and the problem of keeping the animals clean when they are indoors during the winter is a real one. Cows become dirty with any system of housing unless something is done to prevent their being fouled with dung. Much unnecessary labour is used removing any dirt before milking, and if this takes a long time the whole routine of milking is put out of gear.

When cows are housed in cowsheds, the extent to which they become dirty will depend largely on the length of the standing and on the depth and width of the dung channels. Standings which are too long and dung channels which are too narrow usually give the most trouble. There is, however, little trouble with suitably constructed cowshed floors provided they are cleaned daily and there is an ample supply of clean litter.

If cows are to lie clean in conditions of loose housing it is essential to provide sufficient litter in the bedded area. Further, unless the cows are fed and watered away from the bedded area, both the litter and the cows will soon become foul. Overcrowding in yards leads to excessive treading, which often reduces the litter to a quagmire; this is made even worse when the bedded area is exposed to rain. Well planned yards, coupled with good management, help to keep cows clean.

Milk producers well know that the cleanliness of cows at milking time, and the conditions in which cows are housed, are subject to the requirements of the Milk and Dairies Regulations. These Regulations require that the conditions shall be such as to prevent gross and avoidable soiling of the animals and, further, that all dirt from the flank, tail and udder of cows shall be removed before milking begins. Failure to observe the requirements of the Regulations may lead to the suspension or revocation of T.T. licences, or other statutory action against the registration of the milk producer.

Clean milk production demands clean cows, clean buildings and clean equipment. With care and forethought these can all be achieved.

G. T. Morgan

# Book Reviews

**Better Grassland Sward.** ANDRÉ VOISIN. Crosby Lockwood. 42*s*.

Agronomists are fast realizing the paramount importance of ecological studies in furthering our knowledge of crop production. As a vital part of the new science of crop physiology, ecology helps to explain the relationships between the crop and its environment and so light the way to a clearer understanding of how to manipulate those aspects of the environment which are within the farmer's control. Nowhere is this more necessary than in the grass crop. With its life extending over several years, management and environment in all their aspects have a profound influence on the composition and output of the sward.

It is grassland management from this viewpoint that M. Voisin considers in his latest book, ably translated by Mrs. C. T. M. Herriott. By drawing on an impressive array of experimental work and informed comment, he deals particularly with the effect on the sward of different grazing, mowing and manurial practices. A particularly interesting section discusses the causes of declining yield in ageing leys. M. Voisin suggests that these "years of depression", as he calls them, detract considerably from the value of reseeding and that the improvement of permanent grass by renovation rather than ploughing may often be the more profitable course. This is no new stand for him to make, and the evidence presented here gives much for the rest of us to ponder.

Earthworms too have a staunch supporter in M. Voisin. The last section of the book is devoted to their influence on soil and sward, concluding with the suggestion that the historical association of active earthworm habitats with areas of high living standards is no coincidence.

*Better Grassland Sward* is not always an easy book to read. Each chapter, only some two or three pages long, is characteristically subdivided into headed paragraphs, and frequent quotations from articles and accounts of experiments also break the narrative. In some cases, quotations and explanations form the whole of a chapter, and we are left wondering what general application we can draw from a particular piece of work, and indeed, what M. Voisin thinks about it all. Perhaps the greatest need is for some sort of recapitulation at the end of each section, in which the evidence or conclusions of the preceding chapters could be drawn together. But if not always easy to read, the book must have been very much more difficult to write. M. Voisin has done more than collect together a mass of related material, though for that alone we must be grateful to him. The comprehensive author and subject index, together with a full bibliography make this into a useful reference book, but it is also a stimulating one for the more general reader.

*R.S.T.*

**British Poultry Standards.** 2nd Edition. Poultry World. 35*s*.

This edition carries on the tradition by which the Poultry Club guards the breed standards of the individual breed societies and also approves standards on its own where no breed society exists. All the standards are presented in a common form, without losing the intentions of the different breed societies.

The previous edition appeared in 1954, a fact known only to those who are aware that the World's Poultry Congress was held in Edinburgh that year. It is a pleasure to see that the year of publication appears on the current edition, a feature all too often omitted from reference books of this type.

The book is an essential for everyone—breeders, judges or people just plain interested—who are concerned with the domestic chickens, turkeys, ducks or geese that are bred for exhibition purposes. It is also valuable as a reference to plumage pattern features. Since the last edition, standards for bantams of the Campine, Lakenvelder and Sultan breeds have been dropped and new standards for bantams of the Aseel and Faverolle breeds included. New standards are presented for the Longner Rightbreast turkey and the Decoy duck, but it is a pity that illustrations of these two newcomers have not been inserted. Certain standards have been amended, and it would be a help if in future editions a

change of this kind could be clearly identified either by side-lining or by differential print.

Layout has been changed in two respects. Firstly, the glossary of terms, notes on sitters and non-sitters, and those on defects and deformities are now at the back of the book instead of immediately after the introduction. Secondly, the useful note on the preparation of birds for shows has been omitted. Neither change has improved the book, and either may even be regarded as a retrograde move.

An innovation consists of six colour plates illustrating representatives of 47 breeds, in addition to the four colour plates of standard feather markings. The drawings are satisfactory, but the same cannot be said for the colour reproduction in all cases. In the plates of feathers, where it is possible directly to compare the 1954 and 1960 editions, the former are much nearer the true colours. There are short standards for eggs and for table chicken and table duckling carcasses. The print and the black and white art-work are clear and easy on the eye. The paper and binding are of such good quality that the volume should last well, however much it is consulted.

*W.M.A.*

**Land Ownership and Resources.** A Course of Lectures held at Cambridge in June, 1958. ZUCKERMAN, POWELL, PARKER, STONE, MALIEPAARD and DENMAN. The Department of Estate Management, University of Cambridge, and Cambridge University Estate Management Club. 15*s*.

In June 1958 was held one of the summer courses of lectures arranged by the Department of Estate Management, Cambridge University and the Cambridge University Estate Management Club; this book is both a record of the text of the lectures and a summary of the discussion which followed each lecture. In an introduction, Dr. D. R. Denman shows that, although at first sight the titles of the lectures appear somewhat disconnected, together they contribute to a single theme—the estate in land, its nature, the responsibility it places on its proprietor and the need of the state to recognize its significance in the fabric of the industry and the nation.

These summer courses have always been identified in the minds of those attending as being an opportunity for hearing excellent speakers. In this respect, 1958 was a vintage year. The Lord Chief Justice, Lord Parker, spoke on the Report of the Franks Committee, and the book is worth buying for his chapter alone. There are also Sir Solly Zuckerman, "Natural Resources and the National Estate", and Mr. Enoch Powell, M.P., "Development Policy and the National Estate". Mr. C. H. J. Malypaard describes the development of land in the Netherlands, and Mr. P. A. Stone examines "Building Economics" from the point of view of getting value for money. Finally, Dr. Denman himself contributes a clear and thoughtful chapter on "The Estate in Land and the Employment of Resources".

All these are topics of current interest and this small book makes a valuable permanent record of what must have been one of the most important courses arranged in this Cambridge series.

*R.G.A.L.*

**The Economics of Agricultural Land Tenure.** GRAHAM HALLETT. Land Books. 25*s*.

This book is one more plank in the bridge, long needing to be built, between the world of the economist and the professional world of land management. The author brings together the threads of modern debate on the ownership and tenure of Britain's farm land. As an economist he approaches the task from his own side. He arrives safely nonetheless, and enters the practical world of landownership and management like one not unfamiliar with its labyrinthine paths.

Long live the landlords! as powers not as persons is the book's theme song: Mr. Hallett's landlords are not the State Departments entirely—in a persuasive chapter he dismisses land nationalization—but rather companies and institutions of all kinds with a place for the individual landlord and Government Departments here and there. His analysis and judgment are above prejudice, and of the present system he says: "The tenancy system should at least be given a chance to work; it is hardly fair to prevent it from working properly by holding down rents and then to argue that as it is not doing so it should be abolished."

This discerning observation alone should commend the book to all who would meet the issues of today with an open mind.

There are minor themes. A strong case for competitive farm rents is supported by a plea for lower surtax and a limited capital gains tax. Mr. Hallett also insists that

landowners and their agents learn to cast their minds in the mould of business-men —an admonition none can afford to ignore today.

The author's experience and learning as an economist are happily employed to present and pursue the arguments of this worthwhile book. His text, however, is by no means impeccable when he attempts to construe enactments and when he touches the technical side of estate management and taxation. Mature and experienced land agents, mindful of the troubles of the 1930s, will receive with horror the suggestion that dilapidation payments received by a landlord from an outgoing tenant should be passed on to the incoming tenant. One or two historical slips also mar the text. For example, statutory repairs allowances under Schedule A income tax were not introduced, as the author says, at the close of the nineteenth century.

Textual defects strike an unhappy note, notably a habit of dropping the "Agricultural" when referring to Agricultural Land Tribunals and the Agricultural Land Commission. References to the "Land Tribunal" are particularly irritating to readers who are aware of the existence and closely allied activity of the Lands Tribunal set up under the Lands Tribunal Act 1949. And land agents are not likely to welcome the author's repeated references to them as "estate agents".

The book does not pretend to provide new facts. It interprets known facts in novel ways. In substance it is a commendable contribution, missing perfection in its details and by the impression it gives of an able, inspired and informed man writing in a hurry.

*D.R.D.*

**Vitamins in Animal Feeding.** L. R. COLBORN. Fertiliser Journal. 16*s*.

Although the concept of vitamins as essential dietary constituents is still less than fifty years old, twenty-six have been identified and the existence of others is fairly certain. But the results of research into their occurrence and nature are widely scattered throughout the world's scientific literature. In collecting and summarizing much of this information, the author has already earned the gratitude of readers of the *Fertiliser and Feedingstuffs Journal*, in which the series of articles now appearing in book form was first published.

As its history implies, the survey does not include the very latest results—there are not many references to papers published after 1956—but this is only a minor criticism. Primarily, the book is intended for those concerned with the technical aspects of formulating feedingstuffs for modern intensive stock production, and for this purpose it is admirably clear and concise. It should also prove a useful source of reference to advisory officers and veterinary surgeons, indeed all those work involves the nutrition and health of farm animals. Zealous students will find it a helpful guide to original research papers; less energetic ones will probably be tempted to use it as a crib.

The history and chemistry of vitamins A, D, E, K, C and the B group are reviewed, deficiency symptoms described and natural and synthetic sources summarized. National Research Council of America figures are quoted for the vitamin requirements of farm livestock, since British standards are not yet available.

*S.L.*

**The State of Food and Agriculture.** FAO Rome. H.M. Stationery Office, London. 10*s*. (10*s*. 11*d*. by post).

The annual report by FAO on the world's agricultural and food position is an essential tool in understanding that paradoxical situation where a high proportion of the world's population is underfed whilst in certain countries there are large farm surpluses and crop restriction schemes.

The overall figures are that during the year 1959-60 the world's agricultural production increased by about 2 per cent, compared with about 5 per cent for the previous year. This is a very considerable drop, but possibly some of it is due to sampling errors; it is not due to a lessening of production in the "surplus" countries. However, the increase of 2 per cent of production is still above the estimate of world population increase of 1·6 per cent, though the per caput gain of production is hardly significant.

The per caput tables (Nos. 14a, 14b) are particularly interesting. The United Kingdom has increased her average daily calorie intake by 160 to 3,260 calories, and her average total protein consumption by 1 gram to 85 grams per day, per head; but of this the animal protein has risen by more than 10 per cent to 50 grams per head, per day. It is still the U.S.A. and the South American grazing countries that are the big meat eaters—at about 65 grams animal protein per day. This suggests that there is

still room for a considerable expansion of animal husbandry in Britain.

Again, it is in Asia, and parts of Latin America, that the food deficiencies are seen. India (1957) has a per caput calorie figure of 1,800, with 47 grams of protein, of which 6 is animal. Colombia (1957) shows 2,050 calories with 48 grams of protein, 22 of them animal. It is alarming to realize that the per caput food available in the Far East is still 3 per cent *below* the pre-war level.

International trade in agricultural produce rose by 6 per cent, though this was half lost to producers by a decline of 3 per cent in prices.

There was a big increase in stocks of grain, which now stand at 126 million tons, and of coffee (2·6 million tons). This last is equal to the record Brazilian crop of 1959-60!

The price relationship between farmers' income and expenditure appears to have moved slightly in favour of the farmer, except in the U.S.A. and Canada.

*G.O.*

**Experiments in Progress, No. 12** (Annual Report 1958-59). Grassland Research Institute, Hurley, 7*s.* 6*d.*

The latest report of the work in progress at the Grassland Research Institute covers practically the whole range of grassland production studies, from soil structure and microbiology to practical tests of grass and animal management methods. Indeed some studies follow the story through as far as carcass quality assessments for marketing. The work in progress in each of the nine research departments is described, and the more important current results are summarized in some ninety tables. There are in addition an interesting explanatory survey of the work of the Institute by the Director, two special articles (one on soil crumb-structure and the other on the artificial rearing of lambs), a list of the Institute's latest publications and a note on the work of the Commonwealth Bureau of Pastures and Field Crops.

The scope of the Report makes it almost a reference book on contemporary grassland problems, but of course it makes no attempt to act as a guide to practical conclusions for the farmer, and the results are not intended to be treated as final. They must be read in conjunction with previous Reports. With these reservations, the farmer who is prepared to digest the tabulated technical data should have much food for thought, along with the advisory and research people for whom it is intended. No direct studies on the dairy cow will be found, and relatively little on fertilizer usage in relation to metabolic disorders in the animal; but these, unlike beef cattle, lowland sheep, and fundamental grass problems, are already studied by other research organizations.

Among many other often very technical points it is interesting to note work on a practical problem about which most of us are rather complacent, seedling establishment. The effects of severity and season of defoliation on grass production, the contribution of legumes, the relative values for animal production of commercial and pedigree grass varieties, and of permanent and temporary swards, are current controversies receiving attention. Further studies in the outdoor rearing of calves, creep grazing of lambs and the use of hexoestrol are described, and valuable information continues to come from work on seasonal changes in the digestibility of grasses and grass silage. The effect of selective weed-killers not only on the weeds but on sward production is studied, and it is shown that killing the weeds increases the response to fertilizer nitrogen. These are only a few of the topics: there are so many it is tempting to suggest an index.

*D.S.MacL.*

**Farm Management Handbook.** University of Bristol, Department of Economics (Bristol I Province). 5*s.*

The Farm Management Handbook is one of a series of local companions to *The Farm as a Business*, produced by the Ministry of Agriculture for the use of advisory officers and farmers. The 1960 edition follows closely the pattern set last year.

Its first section provides current local efficiency standards by size and type of farm for use in conventional farm management analysis.

The Budgeting Reference Manual, a popular part of previous handbooks, is continued in this edition. It contains a miscellany of information invaluable for partial budgeting, farming discussions, and winter lectures.

A further section, which provides rough and ready guides to comparative gross profits for a selection of farming enterprises, is a new departure. Advisory officers should

find this material of particular use in discussing small farm schemes, or budgeting the effect on profits of a change in the scale of an existing enterprise.

Finally, in the Situation Report, Mr. S. R. Wragg gives a succinct view of the home agricultural situation and discusses past, present and future world production trends for the major commodities.

*S.E.L.*

**A Bibliography of Farm Buildings Research 1945-58; Part III, Buildings for Poultry.** Agricultural Research Council. 4*s.* 6*d.*

The Agricultural Research Council has published Part III of its *Bibliography of Farm Buildings Research*, and this latest part deals with poultry housing. Poultry keeping in all its aspects is a very important branch of British agriculture. Apart from hen eggs there is no support price for its products, and it must be economic—and therefore efficient—to survive.

No branch of agriculture depends more for success upon its buildings. No branch is more suited to intensive, factory-like methods. Gone are the days of the barnyard fowl and the hut in the field.

This latest part of the bibliography emphasizes the great importance of environment in economic poultry management. It gathers together a great wealth of information not only for the designer of poultry buildings but also for farmers. It presents concisely the best available information, in a most attractive form, and provides a ready key to knowledge.

All who play a part in agriculture, from farmer to research worker, should welcome this publication. Without a copy of it they will be ill-equipped to meet the future.

*C.R.*

**The Roe Deer.** (Forestry Commission Leaflet No. 45). H. A. Fooks. H.M. Stationery Office. 1*s.* 6*d.* (1*s.* 8*d.* by post).

The problem of the control of wild deer in Britain is no recent one. Deer have inhabited our woodlands and wild places from time immemorial, and where farm lands have developed near at hand, the richer feeding has often attracted these fine animals. Crops have suffered and the deer are now regarded as vermin. In more recent times, the increase of forest land under the control of the Forestry Commission has afforded considerable opportunity for the increase and spread of deer. Not only has the problem of dealing with damage to trees intensified, but also deer have become marauders on a wider scale than ever before. Since there are no natural predators to prevent this, it is inevitable that man must intervene.

Realizing this, the Forestry Commission prepared this booklet to show how control may be accomplished in the most humane and scientific way. In the past, cruelty had been all too prevalent. In some places, a very high proportion of the deer were maimed. Often they died from wounds inflicted by inexperienced "guns". Even today the same sort of thing continues where foresters and farmers attempt to undertake control without the necessary knowledge.

Major H. A. Fooks, the Commission's Game Warden, has produced this account of the roe deer to assist foresters appointed to control deer. The information is set out most attractively, and provides a clear account of the natural history of this delightful animal, with essential information as to the acceptable methods by which its numbers can be kept within bounds. While the latter are mainly applicable to forest conditions, the advice on stalking and shooting is so important that, in all humanity, no farmer who attempts to control deer on his land can disregard it. The deer of our countryside are a national heritage, and everyone who has to deal with them will find the information in this booklet of considerable help in coping with the problem.

*F.J.T.P.*

**Rural Industries Bureau Annual Report 1959-60.** 1*s.* 6*d.*

The Rural Industries Bureau is maintained by grants administered by a body of trustees appointed by the Minister of Agriculture, Fisheries and Food. It assists rural craftsmen and small country workshops by providing them with expert advice and instruction on both technical and business matters.

For example, the Bureau's experts will visit a workshop to instruct on an improved working technique, or they may provide designs or constructional details. The Bureau gives advice on business methods; on estimating, often the first step towards obtaining work; or on methods of keeping and presenting accounts. Advice on equipment and some degree of financial assistance in its purchase is also provided. An experimental workshop is also maintained, where new equipment and methods are developed

and tested. The Bureau's activities are particularly aimed at keeping rural workshops abreast of change and progress. Its staff regularly receive instruction in new techniques, and are thus able to introduce them to rural workers and enable them to hold their own in the face of competition.

Arrangements have now been made to give expert guidance on the procedure and method of entering export markets. It has often been assumed that these markets were open only to large industrial concerns, but it is made clear in the Bureau's publication, *Export Made Easy*, that this is not so.

An outstanding feature of the year under review is the boom in boat building; this covers the manufacturing of moulded hulls for both work boats and pleasure craft for export.

The report deals with welding, repair and maintenance of agricultural machinery, woodworking, boat building, furniture restoration, hand brick and pottery making, thatching, saddlery, wrought ironwork, willow processing and basket-making.

Copies may be obtained from the Rural Industries Bureau, 35 Camp Road, Wimbledon Common, London, S.W.19.

*A.J.L.L.*

**Museum of English Rural Life Report, 1959.** University of Reading. 1*s*.

Professor Edgar Thomas, Chairman of the Curators of the Museum of English Rural Life, has taken the opportunity in this report to express his concern that the museum cannot hope to preserve more than a small part of the picture of English rural life. During the year, 409 objects have been acquired by the museum through gifts: nine of them are illustrated in the report. A side to the museum's activities which must be of great value is the accumulation of documentary records, and in that connection it is good to know that the N.A.A.S. is helping.

The report shows that the need for classifying material is well recognized, for it contains a most interesting description of the museum's collection of dairying equipment, written by Miss Anne Sheppard, the Senior Lecturer in the University's Department of Dairying. No one could be better qualified than Miss Sheppard to write about these items, for while keeping abreast of the many and rapid developments in the dairy industry, she has cherished an affection for the old craft. To her, the fact that a piece of equipment has become obsolete does not mean that it is an object now to be scorned. She recognizes that many a commonplace thing today becomes an heirloom tomorrow. She not only knows what the objects in the collection were for, but how they were used.

Miss Sheppard also points to the need to fill some of the gaps. So far no example of an early type of centrifugal separator has found its way to the museum, and there are only two milking machines—one of 1912, the other of 1925. It is to be hoped that these and other omissions may in the not too distant future be made good.

The report contains an abstract of the catalogue of dairying equipment listing 112 items and carrying illustrations of 44 of them. It would be of help to the ordinary reader if some idea of their relative sizes were indicated.

*K.H.B.*



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## NEW ZEALAND

### AGRICULTURE DEPARTMENT

Applications are invited for the undermentioned vacancy:

### SCIENTIFIC OFFICER (BIOMETRICIAN) WELLINGTON

*Salary:* Up to £1,355 according to qualifications and experience. An outstanding officer may advance to £2,025 a year on merit.

*Duties:* To assist in the section which advises on the design and undertakes the analysis of research work. Opportunity will be given to specialise in certain aspects of the work which includes research on pastures, field and horticultural crops, animal diseases, soil conservation, poultry testing, dairy products testing and much laboratory work. Appointees will work in close co-operation with research workers in these fields.

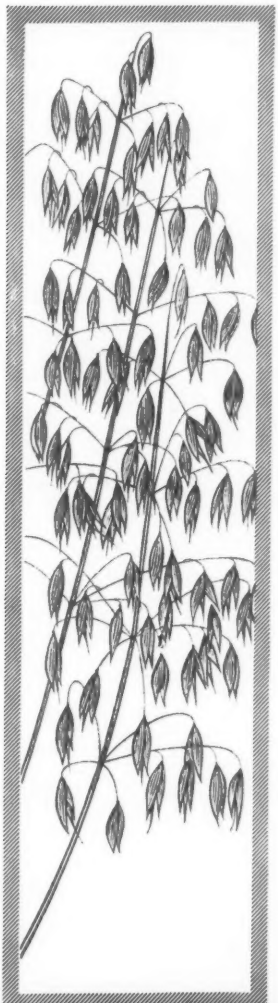
*Qualifications desired:* An Honours degree in mathematics with some statistical training. Experience in consulting work or in analysis of experimental results would be most valuable. Some interest in agricultural matters, the ability to grasp the research officers' problems in their practical and theoretical aspects and to interpret the results of analysis in simple form is essential.

*Passages.* Steamer fares of up to £165 each for the appointee and his wife, and pro rata for dependent children will be paid.

*Incidental expenses.* Up to £35 for a single person and £100 for a married man can be claimed to cover the cost of taking *personal effects* to New Zealand.

Application forms and further details are available from the High Commissioner for New Zealand, 415 Strand, London, W.C.2, with whom applications will close on 20th January, 1961.

Please quote reference B11/2/39 when enquiring.



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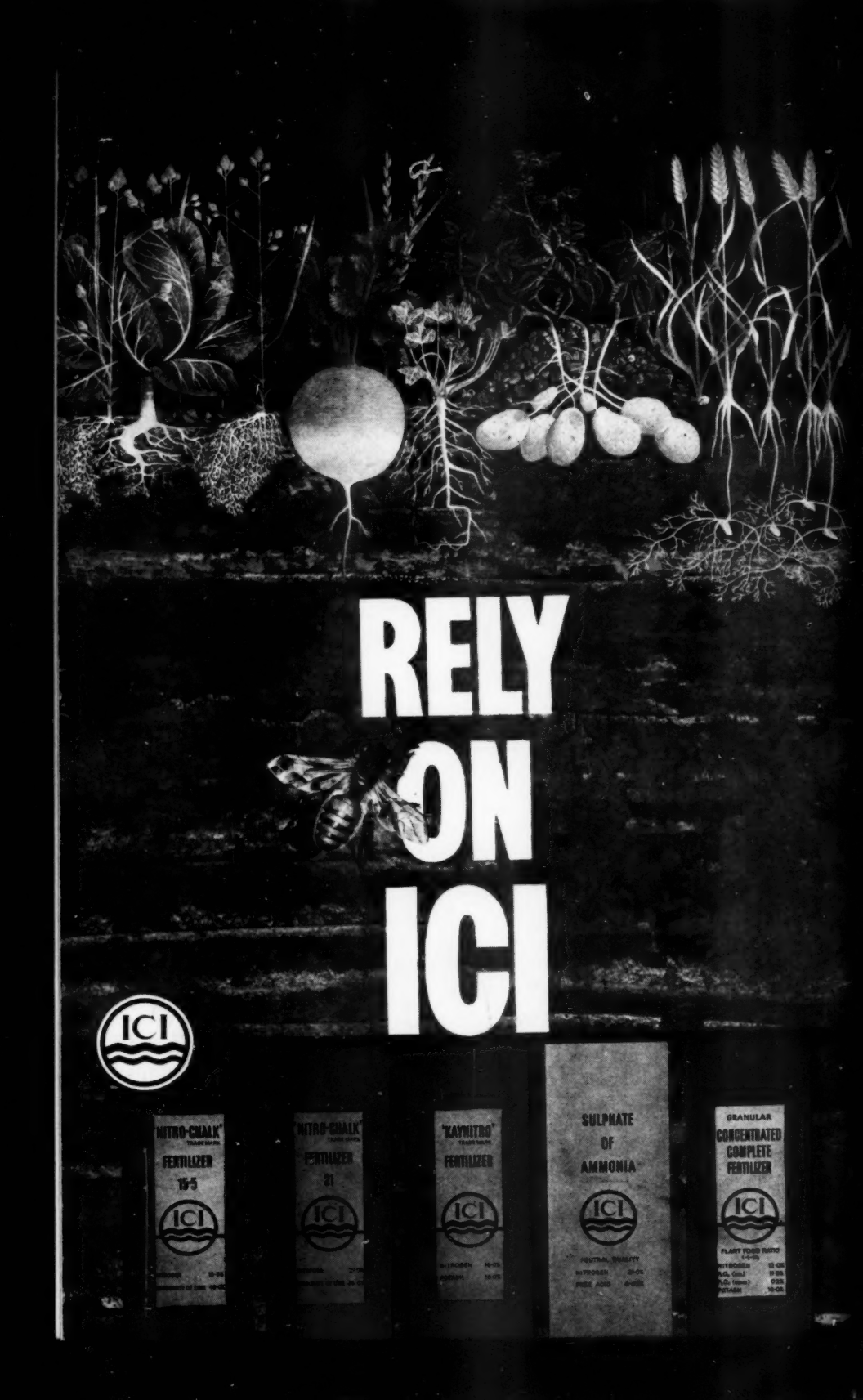
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